JPRS-CST-86-025

1 JULY 1986

China Report

SCIENCE AND TECHNOLOGY

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS-CST-86-025

1 JULY 1986

CHINA REPORT

SCIENCE AND TECHNOLOGY

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

NATIONAL DEVELOPMENTS

Sixth FYP Results for Science, Technology Assessed
(Zhang Jimin, Wu Ming; RENMIN RIBAO OVERSEAS EDITION, 3 May 86) 1

Fang Yi on Scope of Technology Transfer
(JISHU SHICHANG BAO, 18 Mar 86) 3

Construction of Key State Laboratories Underway
(Zhang Jimin; XINHUA Domestic Service, 10 Jun 86) 5

Promotion of S&T With International Aid Discussed
(RENMIN RIBAO OVERSEAS EDITION, 3 May 86) 6

National S&T Achievement Prizes Awarded
(He Huangbiao; RENMIN RIBAO OVERSEAS EDITION, 9 May 86) ... 8

Basic Scientific Research Achievements Reviewed
(XINHUA Domestic Service, 8 Jun 86) 10

'First Major Computer Software Package' Announced
(Wu Jingshu; CHINA DAILY, 11 Apr 86) 12

Problems With Technology Imports Identified
(Chen Qingdao, Yin Zisheng; KEXUEXUE YU KEXUE JISHU GUANLI, No 2, 1986) 14

First Technology Export Trade Fair Described
(Chen Zhiqiang, Yu Fengyuan; RENMIN RIBAO OVERSEAS EDITION, 22 Apr 86) 17

Theoretical Problems in Technology Marketing
(Li Shou; KEXUEXUE YU KEXUE JISHU GUANLI, No 3, 1986) 20

Guo Shuyan on Opening Up Technology Market
(JISHU SHICHANG BAO, 18 Mar 86) 24

Science, Technology Show Great Promise in Helping Poor
(JISHU SHICHANG BAO, 18 Mar 86) 26

Prospects for Provincial 'Spark Plans' Discussed
(LIAONING RIBAO, 6 Apr 86) 28

Fujian Technology Transformation Projects Discussed
(Gong Gao; RENMIN RIBAO OVERSEAS EDITION, 20 Apr 86) 30

Report on Economic Development in Guizhou Mountain Region
(Lin Shuangshuang; JISHU SHICHANG BAO, 18 Mar 86) 32

Hainan Reports Initial Results in Foreign Imports
(JISHU SHICHANG BAO, 18 Mar 86) 34

Hubei's Technology Markets Linked to Producers
(JISHU SHICHANG BAO, 18 Mar 86) 36

Liaoning's Technical Advances Discussed
(Yang Jianzhang; KEXUEXUE YU KEXUE JISHU GUANLI, No 2, 1986) 38

Liaoning's Future as S&T Development Area Described
(Liu Yuqin, et al; RENMIN RIBAO OVERSEAS EDITION, 3 May 86) 41

Tianjin Technology Markets Discussed
(KEXUEXUE YU KEXUE JISHU GUANLI, No 3, 1986) 42

Yunnan's Committees Combine To Train Industrial Leaders
(Lo Dongbao; JISHU SHICHANG BAO, 18 Mar 86) 49

Shifting Military Production to Civil Use Discussed
(Zhang Heping; RENMIN RIBAO OVERSEAS EDITION, 23 Apr 86) 50

Photographs Reveal Details of New 'Zhi-8' Helicopter
(HANGKONG ZHISHI, No 5, May 86) 52

Briefs
Major Soda Ash Plant Under Construction 53
Sino-American Engineering Firm in Gansu 53
Machine Tools To Be Computerized 53
Plans To Double Chemical Products Exports 54

Qinghai Potash Fertilizer Plant 54
Sino-Japanese Word Processors Due for Market 54
Traditional Medicine Modernization 54
Electronics Ministry Decentralizes Authority 55
Advanced Computer Display System Passes Appraisal 55
Science, Technology Commission Prepares White Paper 55
Gansu Economic, Technology Market Opens 55

PHYSICAL SCIENCES

Hydrologic Features in Cyclonic Eddy Region of Northern East China Sea in Cold Seasons
(Ding Zongxin; HAIYANG KEXUE, No 5, 9 Sep 85) 56

APPLIED SCIENCES

Calculation of Detection Range of Low-Light Night Vision Devices
(Wu Baoye; HONGWAI YANJIU, No 4, Aug 85) 64

Briefs
New Chinese-Character Minicomputers 72
New Crystal Material Developed 72
Largest Integrated Circuit Developed 72

LIFE SCIENCES

Briefs
Mongolian Medicine Factory in Liaoning 73
Biotechnology Medicine Helps Control Cancer 73
Blood Substitute Successful on Battlefield 73

ENVIRONMENTAL QUALITY

Major Drive Against Atmospheric Pollution Planned
(Wu Jingshu; CHINA DAILY, 27 May 86) 74

Progress Made in Battle Against Air Pollution
(XINHUA, 26 May 86) 76

Briefs
Steps Against Pollution at Oil, Gas Fields 77

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

Briefs
Gansu Scientists Lead in Glaciology Research 78
Antarctic Studies Society 78

ABSTRACTS

THERMOPHYSICS

GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS], No 1, Feb 85 79

/9986

NATIONAL DEVELOPMENTS

SIXTH FYP RESULTS FOR SCIENCE, TECHNOLOGY ASSESSED

Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 3 May 86 p 1

[Report by Zhang Jimin [1728 4949 3046] and Wu Ming [0702 2494]: "Key Projects of the Sixth 5-Year Plan Completed According to Plan As More than 100,000 Scientists and Technicians Work Tirelessly"]

[Text] With the tireless efforts of more than 100,000 scientists and technicians over the past 3 years, the 38 key science and technology projects arranged by the state during the "Sixth 5-Year Plan" have accomplished their missions according to plan. By February of this year, 3,896 important scientific and technical achievements had resulted, among which 3,100 have been applied in production to make great economic results.

The 38 key national scientific and technical targets of the "Sixth 5-Year Plan" began in 1982. The projects included 114 general topics and 1,450 specialized topics. The fields covered involved the eight areas of agriculture, energy, transportation and shipping, mechanization and electronics, raw materials, consumer goods industries, rising new technologies, and social development, which encompasses the primary areas of business in China's national economy. For 3 years, the more than 5,000 science research organizations and higher institutions participating in the key effort made the scientific and technical targets of the "Sixth 5-Year Plan" a major battlefield of science and technology, carrying on a very effective combined operation that involved many disciplines, many kinds of soldiers, and that traversed sectors.

According to statistics, of key national scientific and technical projects during the "Sixth 5-Year Plan," 98 percent have completed their tasking in accordance with their contractual progress. Among them, 1,050 specialty contracts have been completely fulfilled, and another 370 specialty contracts have been continued into the "Seventh 5-Year Plan" for completion, as planned. Because the key projects have focussed on solving actual problems in production and social development, the rate at which science research achievements have been transformed has been high, reaching 80 percent. At the same time as we have gained scientific and technical achievements, 122 production lines have been set up in all major sectors of the national economy. And 158 different ecological agricultural experimental stations were set up, and instruments and equipment were added to a group of targeted

laboratories. This strengthened our capacity for scientific and technical development and laid a solid foundation for scientific and technical development during the "Seventh 5-Year Plan."

The standards for the scientific and technical achievements have been quite high and the economic results outstanding, which was one of the characteristics of the key scientific and technical achievements during the national "Sixth 5-Year Plan." As for example with key problems in crop breeding technology, where 327 fine new varieties and combinations of major agricultural crops were selected for cultivation, and had an average yield of 20 billion jin and more. The comprehensive oil extraction technology when petroleum has a high water content ensures that the Daqing oilfields will have stable production over a long period. For the key problem of comprehensive mechanization of coal mining, annual coal extraction for the domestically produced low incline medium thickness coal vein comprehensive extraction unit exceeded the 1 million ton threshold, and the entire set of equipment is produced in this country. For the key problem of textile science and technology, we have successfully developed a set of equipment and production techniques that annually manufacture 15,000 tons of staple polyester fibers, which has allowed our polyester fiber staple production technology to enter the world's advanced ranks. This technology has already been used in major chemical fiber engineering. Research into type-B hepatitis blood-based vaccine has overcome problems with large quantity production techniques and quality control technology, and has manufactured 400,000 human doses for a more than 80 percent inhibition rate for hepatitis.

Persons in charge of relevant areas feel that national scientific and technical achievements in problem areas during the "Sixth 5-Year Plan" have clearly shown that China has preliminarily formed a scientific and technical contingent that is of excellent quality and has a great capacity for solving key problems, and that it can solve key scientific and technical problems in the national economy and in social development. They feel that it will play a greater role in the development of the national economy.

12586
CSO: 4008/2110

NATIONAL DEVELOPMENTS

FANG YI ON SCOPE OF TECHNOLOGY TRANSFER

Tianjin JISHU SHICHANG BAO [TECHNOLOGY MARKET WEEKLY] in Chinese 18 Mar 86 p 1

[Text] Fang Yi, a member of the CCP Central Committee's Politburo and member of the State Council, emphatically pointed out at the First National Technology Market Work Conference that technology development organs, the intermediary organizations undertaking the transfer of technological achievements, and the activities they are engaged in such as technology transfer, technical consultation, technical service, and technical training do not come under the business scope of party and government cadres. In developing technology markets, it is also necessary to adhere to the policy of openness, liveliness, fostering, and guidance. However, the technology development organs and intermediary organizations sponsored by government organs and their subordinate units can only engage in the above-mentioned activities, and they cannot engage in trade activities that have nothing to do with technology. Those organs that have in the past engaged in trade activities must cease their activities immediately. In the course of engaging in technology transfer, these organs must also comply with the pertinent state laws and stipulations, and such illegal activities as swindling, unauthorized purchasing and selling at a profit must be strictly prohibited.

Fang Yi also stated that the development of technology markets is the policy decision of the central authority and is a compeltely new thing. During the past year, the technology markets throughout the country have shown tremendous growth and excellent momentum and have made very gratifying gains. However, the technology markets remain in the initial stage. Certainly, they will encounter numerous new situations and new problems on the road ahead and need to make improvements continuously and strengthen coordination and guidance. We cannot be too anxious in achieving success and treat the problems as too simple, nor must we lose confidence as soon as we encounter difficulties. The technology markets must be vigorously developed and must be given active support. The present situation, trend, and problems of technology markets throughout the country must be earnestly analyzed and studied. At present, the question of integrating our country's science and technology is far from being solved. Our ability to turning the fruits of our research into industrial and commercial products is quite weak. Information on the supply and demand of the fruits of our research is still comparatively

inaccessible, the capacity of the fruits of our research to form complete systems is poor, and the vigor and motive power of large and medium-size enterprises in purchasing technologies have not yet been brought into play. There is much work to be done in the development of technology markets.

Comrade Fang Yi also emphasized that the most outstanding question at present is to take a firm hold on formulating some policies and regulations on forming complete sets of technologies, strengthening the management of technology markets, and doing a good job on legislative work on the basis of investigations and research. The development of technology markets is not merely the work of science and technology departments, but all departments concerned must also work in full cooperation to foster the technology markets. There are buyers as well as sellers in the technology markets. It is necessary to bring into full play the enthusiasm of both sides, particularly the enthusiasm of the large and medium-size enterprises. The technological progress of the large and medium-size enterprises is an important basis for the four modernizations construction program.

12949/7358
CSO: 4008/2098

NATIONAL DEVELOPMENTS

CONSTRUCTION OF KEY STATE LABORATORIES UNDERWAY

OW101425 Beijing XINHUA Domestic Service in Chinese 0755 GMT 10 Jun 86

[Article by Zhang Jimin]

[Excerpts] Beijing, 10 Jun (XINHUA)--China was to build 20 key state laboratories during the Sixth 5-Year Plan to improve the standard of scientific research and experiments, promote interdisciplinary study, and establish long-term reserve forces for scientific and technological research. Some of these laboratories have been completed ahead of time and used in scientific research. Most of them are being built as scheduled.

Since the appropriation of state funds in 1984, departments and units concerned have worked closely to ensure the smooth progress of key state laboratories. As soon as the genetic engineering laboratory at Shanghai Fudan University was completed at the beginning of this year, the laboratory's first academic committee discussed and decided on the funding of 10 projects. As of March, research on these projects was already underway.

It is learned that during the Seventh 5-Year Plan, China will appropriate funds for the construction of another 50 key state laboratories. A responsible person of the department concerned of the State Planning Commission said that, on completion, these key state laboratories will be of advanced international standards in terms of instruments and equipment, and also be superior in academic standards, scientific research objectives, and training of outstanding scientific research personnel. The key state laboratories should welcome and recruit qualified personnel of all disciplines concerned to participate in research, and should occupy an important place in tackling high-tech projects as well as strengthen and promote basic research and applied studies in China.

/9716
CSO: 4008/71

NATIONAL DEVELOPMENTS

PROMOTION OF S&T WITH INTERNATIONAL AID DISCUSSED

Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 3 May 86 p 3

[Text] Over the last few years, China has had outstanding results from the importation of foreign advanced technology and the importation of foreign technical personnel, both through aid from the United Nations Development and Planning Funds and through international multilateral technical aid.

As authorized by the Chinese government, the Chinese International Economic and Technology Exchange Center ("Center," hereafter), together with the United Nations Development and Planning Fund and countries or civil organizations participating in multilateral aid, have joined to study and determine more than 200 aid projects. Among them are included energy and geologic development projects, science research and detection projects, education and social welfare projects, and comprehensive information projects. After the projects have been ascertained and based on actual need, the "Center" invites foreign specialists or sends people abroad for study, related expenses being provided by the supplier of aid.

Some of these projects are to establish professional and technology development centers and technology demonstration plants or stations, for which foreign specialists are asked for direction. As for example the vegetable research center and export commodities packaging research center set up in Beijing, the micro-algae cultivation center, and the soil resource utilization experimental station built on the loess plateau of northern Shaanxi, all of which have been quite successful. This has been especially true of the ecological vicious cycle problem with the serious soil erosion on the loess plateau and "low production--opening of wasteland--even lower production," where using aid from the United Nations Development and Planning Fund, in 1981 at Mizhi County, at an experimental area of 108 sq km involving 3 small drainage areas, peasants were directed in the replanting of forests. They also planted various kinds of grasses and trees and developed grazing, which consequently accelerated the full scale development of farming, forestry, herding, and by-products, and which led to a great increase in farmer income. This was one of the more successful projects, which not only served as a model for comprehensive management of the loess plateau in China, but also sought to realize an ideal solution for loess, hilly regions in the world.

Some projects have focussed on solving certain technical difficulties or in improving technical standards, for which foreign specialists have been invited to speak or to consult, or people have been sent abroad to study. For the last few years, and with the aid of support projects, China has invited more than 2,000 foreign specialists; we have sent nearly 2,500 people abroad for observation or advanced study. As the national economy has developed, the amount of discharge of powdered coal ash from coal-fired power stations has increased annually, and control and comprehensive utilization of the powdered coal ash has been an urgent problem. In 1983, China signed an agreement with the United Nations Development and Planning Fund, where with allocation by the development fund, a "powdered coal ash utilization research and development" project would be set up in Shanghai. Fifteen people were first sent abroad for observation and study, then several renowned foreign specialists were invited to China for guidance and lecturing. Within 3 months, 2,400 people heard those lectures. In addition, funds have been used for purchase of electronic sensing apparatus. Implementation of this project not only resolved difficulties with controlling powdered coal ash, but resulted in a series of achievements in evaluating the quality of coal ash and with studies into the durability of coal ash mixed with clay.

China has also used support from the United Nations Development Fund and from civilian organizations in friendly countries, together with some of our own money, to implement some development construction projects to strengthen old (liberated), minority (various races), border (Xinjiang), and impoverished (hard-pressed) areas. As for example investments in Xingguo County, Jiangxi, to develop heavy rare-earth resources, or in Luoning, Henan, to help set up a bamboo composite board plant, or to help Wuyi County, Hebei, to drill wells, all of which projects have achieved results. It has been reported that at present water purification projects have begun in poorer counties of Gansu.

In addition to inviting foreign specialists in the process of implementing the projects just described, the "Center" has used international aid to bring in technical talent through the two channels of "inviting Chinese of foreign citizenship back to China to teach technology" and "inviting specialists through the retired personnel organizations of developed countries." They have gone to relevant units in the interior to pass on technology. By the end of last year, more than 500 specialists of Chinese birth or race and more than 50 foreign specialists had been invited through these two means. These specialists came from the United States, Japan, England, France, Belgium, Canada, and Thailand, and the areas in which they helped included the disciplines of industry, agriculture, urban planning, science research, and economic management. Each had his specialty, and in the areas of computer research and applications, crop genetic breeding, new techniques in electronic product testing, and new techniques for leather tanning, they have helped China solve many difficulties demanding prompt attention.

The Chinese International Economic and Technology Exchange Center director, Bu Zhaomin [0592 2507 2404], spoke to reporters, saying, that by bringing in technical expertise through the international aid projects, this has been an effective means to hasten economic and scientific and technical development in China. He said that he hopes that regions and professions everywhere in China will be aware of and use these means. He also hopes that international .pa organizations, civilian organizations in all countries, and foreign Chinese organizations will introduce even more well-trained foreign specialists to come to China to teach technology, which will develop broad technical cooperation.

12586
CSO: 4008/2110

NATIONAL DEVELOPMENTS

NATIONAL S&T ACHIEVEMENT PRIZES AWARDED

Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 9 May 86 p 1

[Report by He Huangbiao [0149 7806 1753]: "National Prizes for Scientific and Technical Advances Finally Determined; More than 3,000 Scientists and Technicians Will be Awarded Prizes"]

[Text] After 3 months of debate, of the 1,772 nominations for the first national prizes for scientific and technical advances announced last October, it was finally determined in April of this year that 1,761 would be awarded prizes. At the National Science and Technology Awards Ceremony to be convened next week in Beijing, Premier Zhao Ziyang and other leaders will present awards to more than 3,800 scientists and technicians.

Spokespersons told reporters about all this yesterday, 8 May, saying that these prize winning projects have already played an important role in our national economic and social development. Based on preliminary statistics, in the civilian category of winners alone, accumulated economic results have reached 110 billion yuan, 244 projects among which accounted for annual economic results of more than 10 million yuan, 377 have had annual economic results of 1 million yuan and above, while more than 170 prize winning projects have had great results with controlling pollution and improving working conditions, safeguarding and improving the ecologic environment, and in protecting the health of the people. Many prize winners on the national defense science and technology front have made up for deficiencies in our military armaments, and certain individual technologies reached internationally advanced standards.

Winners of the first national awards for science and technology advances were numerous, broad in scope, and included many specialized fields such as national defense, mechanization, electronics, chemical engineering, mining and refining, textiles, agriculture and forestry, medicine and pharmacology, water conservancy, electric power, transportation and shipping, city planning, environmental protection, standards, measurements, and disaster prediction, as well as the dissemination of achievements and scientific and technical information. There have never been so many prizes or such broad scope.

These prize winning projects were difficult, had high standards, and were very creative. Looking at the special prize winner, "New Technologies for

Constructing the Chengdu-Kunming Railway," for example, that railroad is more than 1,100 km in length, 600 km of which was bored through precipitous and world famous gorges and river valleys, and more than 300 km are situated in high intensity earthquake areas, once called by a foreign specialist a "no man's land" for railway construction. The hardships and dangers of this project, and the engineering difficulties have been seldom seen in the world. The comprehensive technology for building a railroad used by China's engineering and technical personnel--the new technology, the new structures, the new designs, were of the latest world standards. They were remarkable for breaking through natural barriers and "forbidden areas," and with high quality and high speed completed the construction mission to put through this country's great shipping artery. Or, as for example with the projects involving carrier rockets, communications satellites, and remote sensing technologies, which are all projects of highly technical comprehensive development and highly difficult preparations. In the process of development, all prize winners used the great efforts of engineers and technical personnel, and all embodied their incomparable wisdom and creativity.

Among the prize winners, many projects were very grand projects, and for this reason involved many sectors, many professions, and many disciplines. In some, several hundreds of people, or several thousands, or even several tens of thousands took part. The completion of some projects was through the struggles of just a few, who even paid the final price before their completion.

12586
CSO: 4008/2110

NATIONAL DEVELOPMENTS

BASIC SCIENTIFIC RESEARCH ACHIEVEMENTS REVIEWED

OW081302 Beijing XINHUA Domestic Service in Chinese 0700 GMT 8 Jun 86

[Excerpts] Beijing, 8 Jun (XINHUA)--According to the State Scientific and Technological Commission, the efforts of 20 departments, 97 units, and 3,500 people have enabled 20 key projects organized by the state for research in basic sciences during the Sixth 5-Year Plan to be completed on schedule with fruitful results achieved. So far, 238 assignments have passed the test, of which 159 have received various kinds of awards. Some of the achievements with practical use have already been transformed into productive forces, and have scored optimum results in industrial and agricultural production.

Included in the research projects were some major fields in the sciences of mathematics, physics, chemistry, mechanics, biology, mechanical engineering, material science, engineering thermophysics, corrosion, and protection. The assignments of most projects were based not only on the special characteristics of each scientific subject, but also the spirit of gearing basic science research to satisfying the needs of our economic development as much as possible. Consequently, most projects are of certain practical value in the area of energy sources, utilization of resources, materials, environment, and development of new technology for China's economic construction.

Among the fruitful results scored by Chinese scientists, some have attracted the attention of their counterparts abroad. The research of the A803 serial rare-earth catalyst conducted by the Applied Chemistry Institute of the Chinese Academy of Sciences in Changchun has made possible for the first time production of nitric acid without using platinum. The product, with the same property as that using platinum, can save 90 percent of investment. The project on corrosive stress of high-strength low-alloy steel carried out by Qinghua University, being used in railway bridge piers and bolts of the Baoshan Iron and Steel Complex alone, has saved over 10 million yuan.

Remarkable achievements have also been made in the theoretical study of basic sciences. Some of the 6,870 papers already published have reached the world's advanced academic level. In the research on the corrosive stress and the mechanism of hydrogen-induced cracking of metallic materials, the Beijing Iron and Steel Institute has put forth a new branch, fracture chemistry, which, together with fracture physics and fracture mechanics, is one of the three major theoretical pillars in the study of fracture science.

Along with the fruitful results achieved, quite a few top-notch scientists have emerged among the young and middle-aged scientific personnel engaged in basic research, who have tempered and improved themselves over the past 3 years. Of the 2,500 postgraduates, 47 have received doctorate and nearly 900 master's degree.

/9716
CSO: 4008/71

NATIONAL DEVELOPMENTS

'FIRST MAJOR COMPUTER SOFTWARE PACKAGE' ANNOUNCED

HK111207 Beijing CHINA DAILY in English 11 Apr 86 p 3

[By staff reporter Wu Jingshu]

[Text] China's first major computer software package is now available, it was announced in Beijing yesterday.

Also announced was that scientific institutes and research units began this week for the first time to apply for government funds and bid for government-sponsored projects. Funds for natural science research projects have been doubled this year.

Called a "major step forward," the new Software Package for Modern Digital Signal Processing was developed by the Northern Jiatong University's Information Science Institute together with five other institutes in Beijing, Shanghai and Xi'an.

"It can be readily applied to the IBM-PC/XT personal computers now used by thousands of Chinese research or production units," Professor Yuan Baozhong, director of the university's Information Science Institute, said in Beijing yesterday.

China has imported tens of thousands of personal computers over the past few years, but many have not been fully used because of a lack of software or trained technicians, scientists said.

Yuan and his team worked for two years to produce the software package. It "contains all the latest programmes for digital signal processing known internationally" in its 14 two-faced 5-inch disks. The package covers a total of 42 programmes in seven chapters "ranging from measurement statistics to modern spectral analysis," Yuan said.

Professor Ke Yiu'an, computer expert and vice-president of the Beijing Polytechnic Institute, described the new software package as a godsend to thousands of Chinese computer users, both specialists and amateurs.

"With the help of this new package, experts can save many hours checking new theories, while amateurs can easily adopt programmes contained on the disks instead of racking their brains to develop one themselves," Ke told CHINA DAILY.

Many researchers and engineers, specializing in their own professions, may not be familiar with the signal processing system of a computer, he explained. "That is where the software package will prove handy."

The software package, as testing has proved, is immediately useful in seismological, geological, oil-prospecting, acoustical, biomedical, radar and communications projects, according to Associate Professor Zhu Weimin of the Beijing Telecommunications Institute, who was on the appraisal board for it. He called it "a major science achievement" of the 6th Five-Year Plan (1981-1985).

Meanwhile, the State Natural Science Fund Commission has begun to accept applications for funding science projects. Beginning this year, the state will no longer distribute funds equally among institutes but will let the commission approve projects through application and a bidding system "case by case."

While supporting basic research, the commission said it would give preference to projects that are "essential to modernization and likely to produce results within three to five years, especially those undertaken in border provinces."

/6091
CSO: 4010/1042

NATIONAL DEVELOPMENTS

PROBLEMS WITH TECHNOLOGY IMPORTS IDENTIFIED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENCE OF SCIENCE AND MANAGEMENT OF S&T] in Chinese No 2, 1986 pp 2-4

[Article by Chen Qingdao [7115 1987 6670] and Yin Zisheng [1438 1311 0581]: "Problems of Technology Imports to China"]

[Text] Looking at the history of industrialization in the countries of the world, technology imports have played an important role in the promotion of economic development. In general, technology importation has the following advantages:

First, it is advantageous in gaining time, avoids detours, and lays the foundation of industrial and agricultural production on more advanced technology.

Second, it can economize construction investment and raise the rate of labor production to gain better economic results.

Third, it is advantageous to cultivate Chinese science and technology and modern management personnel to raise the level of S&T and management.

In general, the situation in technology importation is fine and has good prospects. However, owing to the lack of experience in large-scale technology imports, and the lack of soundness in the economic legislation about technology importation and in management systems, there still exist some problems.

1. An overall strategy of development for technology importation has not been established and there is no overall planning. Owing to the lack of consistency in the economic system, technology importation in the departments of the central government and in the local governments does not have overall planning; the blind importation of technology causes repetition and waste and consequently the limited foreign exchange of the state cannot be put to best use. Some items of new technology have been developed by the local S&T research units while some enterprises still want to import, thus smothering the results of the local S&T research units.

2. There is a lack of organized measures in the work of the digestion and absorption of imported technology. Often there are people in charge of the importation work while there is none to bother with digestion and absorption after importation.

3. The function of the local experts has not been fully developed in the work of technology importation. The people in charge of importation neither are familiar with the professional technology nor bother to ask related experts. Consequently, they give final verdicts without scientific analytical proof and this results in wrong decisions.

To give full play to the positive role of technology importation in the development of national economy, based on the practice of our technology imports and drawing on the experience of success in foreign countries in the importation of foreign technology, we must pay attention to solve the following problems:

1. Technology importation must start according to the national conditions. What are our national conditions? In general, they are a poor national infrastructure, a large population, and a backward standard of S&T. This requires that in technology importation, we must select, have plans, and emphasize importing high technology and through digestion and innovation fill the blank and shorten the gap between the technology of the world's advanced technology and our own. We must combine the characteristics of our national resources of products and our superiority in rich labor resources to import "medium technology" which requires less investment and provides quick results and great economic results. And we must insist on not importing anything that we can manufacture.

2. Technology imports must be comprehensive and balanced. Our country is a socialist country where economic planning is supposed to be carried out. There should be an overall plan about which technology and equipment should be imported to which district or department, the size and the scale of the importation, and the priority, importance, and urgency of the importation, and it must tally with the development plan of our society. We must also provide an overall picture to proceed with comprehensive balance, based on the capital available, our technology level, the ability to digest, absorb, and fit, the supply of materials and energy, the condition of transportation, and market forecasts.

3. We must make the best of the "window function" of the special economic zone and the coastal cities opened for technology imports. The purpose of the establishment of the special economic zone, which provides high pay, is to attract some technology-intensive and knowledge-intensive enterprises in order to be the window on the world's advanced technology and advanced management. The special economic zone and the open coastal cities have better foundations for industry, great power in S&T research and technology, and better transportation and geographical conditions. To import foreign advanced technology to these districts may play a pivotal role in the two "sectors" of technology transfer from abroad to the country and the transfer of advanced technology and equipment from the coastal cities to

the inland. We must decide, on this foundation, the focal points in the import of technology to the opened cities, and we must adhere to the principles of fixed focal points, suitability, and better digestion in order that each can make up the other's deficiencies from his own surplus to coordinate development.

4. We must pay attention to the digestion and absorption of imported technology, strive for innovation, and provide it with some Chinese characteristics. In the calibre of our strategy, we must strive for the work of digestion and absorption, hasten the formulation of the related stipulations and administrative measures, and put this work gradually on an organized and planned track.

5. Imported technology must be combined with technological innovation by the current enterprises. To import foreign technology to achieve the technological reform of certain enterprises, we must select the right breach and grip the weak link to import key technology with emphasis and purpose. We must also use it as a foundation to proceed with technology reform, which is an effective method in the reform of our technology.

6. In the importation of technology, we must at the same time import advanced management. We must combine it with the local conditions and improve it to build a completely scientific management system. Only through continuous improvement and raising the standards of management can the function of technology importation be put into full play in order to achieve better economic results.

12909/9738
CSO: 4008/2087

NATIONAL DEVELOPMENTS

FIRST TECHNOLOGY EXPORT TRADE FAIR DESCRIBED

Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 22 April 86 p 3

[Report by Chen Zhiqiang [7115 2535 1730] and Yu Fengyuan [0060 6646 3293]: "Chinese Technology Moves Toward the World"]

[Text] The China Shenzhen Technology Trade Fair was held in Shenzhen from 10-20 April. This was the first large technology export event organized by China.

The success of this technology trade fair signifies that China is no longer solely a technology importing country, for at the same time we are a technology exporting country.

More than 2,000 people in industrial and commercial circles, science and technology circles, and banking and trade circles from more than 20 countries and regions, such as the United States, Japan, France, Finland, Canada, Thailand, Australia, Mexico, Great Britain, Singapore, Madagascar, and Hong Kong, came to participate in this grand occasion. Although the more than 1,700 technologies and products exhibited at the fair were only a small portion of China's scientific and technical achievements, fields were broadly represented and the technology was advanced, which attracted customers to the fair. Of the many overseas Chinese customers who have gone to live in countries other than China, none could help but be proud of the scientific and technical strength possessed in great measure by the Chinese people. After a Mr (BAO ER) of the American Institute of Aeronautics and Astronautics (AIAA) and the Tokyo Computer Company had visited the trade fair, he sought out fair personnel to express his feelings. He said that in the past when he had visited many technology exhibitions in China, the majority of things exhibited had been foreign technology and equipment, where China had hosted exhibitions as a buyer. All of what was exhibited at this trade fair were China's own technical achievements. They were to be exported and sold to foreign countries, which was really surprising to him. It was his belief that for China to hold such a large scale technology trade fair would allow other countries in the world to realize that China truly has many high level technologies, and would be sure to promote the interchange and advancement of technology. Foreign newspapers have published many evaluations and have considered that "Chinese technology exports will change the situation in the world technology market in which Western industrial countries enjoy the sole

rights to technology exports." "This technology export trade fair will enhance China's capacity for exporting and for the earning of foreign currency, which will accelerate the drive toward modernization and the revitalization of China, and will be a very large step forward."

The themes of this trade fair were "Exhibit technology," "Exchange information," "Open channels and develop together," "Serve wholeheartedly, enrich mankind."

Members of the 8 trade delegations sent by units of the Ministry of Nuclear Industry, the Ministry of Astronautics, the Ministry of Aeronautics, the Ministry of Ordnance, the Ministry of the Electronics Industry, and the China State Shipbuilding Corporation, as well as rising new companies, warmly entertained guests from all countries all day long. In the conference rooms, hosts and guests held heart-to-heart talks; in front of the exhibits, modest and amiable workers took great pains to respond to the various questions put by customers.

Faced with questions of universal concern to countries throughout the world concerning food, energy resources, ecology, and information, each trade delegation selectively provided a group of practical technical projects for customers, practical technologies and products in areas like civilian aircraft, shipping, industrial waste processing technologies and equipment, and wind-power generators.

Persons in charge of the space technology trade delegation told reporters that since 1970 China has successfully launched 18 satellites, which shows that China's space technology has entered the ranks of the world's most advanced. To use this mature technology to enrich mankind, they are preparing to take on the business of launching satellites for foreign customers at preferential prices, as well as the services of designing practical communications and broadcast satellites, resource exploration satellites, and space physics exploration satellites for foreign customers.

The nuclear technology trade delegation also indicated that they are willing to design and construct micro reactors and small and medium nuclear power stations for foreign customers at preferential prices, and to provide isotope and radiation technology, as well as complete technologies for remote sensing, magnetic survey, aerial survey, and radioactive testing.

In the auditorium of the trade fair exhibition, one object or model after the other, one photograph after another, and one technical material after another led people to express with confidence that China has a definite basis in space technology, shipbuilding technology, nuclear technology, aviation parts processing technology, and in other purely technical fields.

The potential advantage held by Chinese technology in the international marketplace has attracted foreign customers. Many customers said that they are willing to be publicizers and collaborators as China's technology moves into the world. The Hong Kong branch office of the famous American [Luo Xi Er] financial consortium and those in charge of the Hong Kong [Luo Zhai] and Son, Ltd., want to invest in and construct in China large scale technology

projects with futures for development, and in a world context are willing to lend funds for developing China's space technology; Mr. Cai Zhenqin [5591 6966 2953], director of Singapore Euro-Asian Science and Technology, Ltd., has said that he would like to introduce the technology of China's Beijing Aviation Institute to Singapore and the rest of the world; the Swedish FFW Aviation Technology Company wants to cooperate with our Ministry of Aeronautics to allow the Chinese Yun-12 aircraft to enter the world marketplace; a New Zealand commercial agent said that he is willing to sell the Chinese Honeybee Model 3 ultralight aircraft in New Zealand and Australia.

In orienting to the world, to modernization, and to the future, the burden of China's technology is heavy and it has a long way to go. It is just as Xie Guang [6200 0342], director of the China National Shenzhen Technology Trade Fair said in the opening ceremonies, that all things are difficult to get going. We were determined to take the first step toward entering the world technology marketplace, as well as to prepare to keep moving forward.

12586
CSO: 4008/2106

NATIONAL DEVELOPMENTS

THEORETICAL PROBLEMS IN TECHNOLOGY MARKETING

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENCE OF SCIENCE AND MANAGEMENT OF S&T] in Chinese No 3, 1986 35-36

[Article by Li Shou [2621 1108] of the Tianjin Center for Science and Technology and Personnel Development: "Some Theoretical Problems Regarding the Commercialization of Technology"]

[Text] In early November 1985, six provinces and cities, together with the magazine publishing company LATENT SCIENCE [QIAN KEXUE], held the second National Academic Conference on the Commercialization of Technology in Chengdu (the first National Academic Conference on the Commercialization of Technology was held in Harbin in early February 1985). More than 70 people attended the conference, including theoreticians, practical workers, natural scientists, and social scientists. They carried on a broad and thorough discussion of various theoretical problems regarding the commercialization of technology based on the spirit of the resolution by the Central Committee regarding restructuring the economic system and the science and technology system and in accordance with the fundamental principles of Marxist laws of value, with regard to our actual national situation and the experiences we have already had. Positive results were achieved.

1. Regarding the problem of whether technology is a commodity. The majority felt that technology is a commodity and that it has the dual nature of a commodity, namely that it has a value and a practical use as well that can become part of both production and consumption through the medium of exchange. But there were also people who felt that "Technology is not a commodity because in light of the Marx definition of commodities, a commodity must first of all be an object, and technology is not an object. Moreover, technology has no value, nor any use value. This is because value is a transformation of the object by labor; use value is a natural attribute of an object." Differences were expressed with this view. It was pointed out that whether or not technology is a commodity does not depend entirely upon whether or not it is an object, but rather should depend upon its intrinsic attributes. Moreover, speaking of technical commodities, they themselves have the essential factor of "objectness," and technical commodities can be distinguished as hardware and software. So the physical component cannot be denied, and it is a commodity. We cannot simplistically and mechanically apply a few Marxist theses, nor can we remain at the theoretical level of research of his time. From the beginning of the 19th century, there have been

patent systems in industrially developed countries. They have formally bought science and technology as commodities, and the exchange of scientific and technical commodities has crossed national boundaries to develop internationally. After World War II, international trade in technology abruptly increased several times over what it had been. When technology is traded it becomes a commodity. The production of technical commodities is a necessary consequence of production forces and a commodity economy, and is an objective requirement of economic and technical interchange and of social and economic development.

Looking at the commercialization of technology over time, this has been a historical process. This process has definitely not been an objectification process for technical commodities. In view of scope, it has been a question of popularization and socialization.

2. Regarding the problem of the formation and development of the technology markets. Everyone felt that since the 3d Plenary Session of the 11th CPC Central Committee, implementation of compensated transfer of the rights to technology has developed from supplying the spontaneous trade between two parties to the successive establishment and professionalization of scientific and technical consulting companies and science and technology development centers in all areas; from the convention of technology trade fairs to the appearance of permanent technology markets and technology stores, and especially after the speech by Premier Zhao in November 1984 on the commercialization of technology and the technology markets, hierarchical, multi-channel, and multi-format technology markets developed rapidly, and have played an ever more prominent role in urging the circulation of technical commodities and in accelerating economic construction.

3. There was discussion on the position and function of the three entities that are the buyer, the seller, and the intermediary, and on operational strategies. And there was prominent discussion of the problem of the function of intermediaries before, during, and after negotiations.

Before negotiations, the intermediary serves as a bridge. Included in this function are: 1. to gather and provide information; 2. to understand the performance, characteristics, results, conditions of operation, flexibility of selling price, modes of transfer, and the modes and degree of after-sales service for the seller's technical achievements; 3. to sell by various means; 4. to understand the situation regarding the desires, funds, technology, and equipment of the buyer and management capabilities; 5. to arrange for both parties to prepare for negotiations. The focus of their work is to be sure of the reliability of the seller's achievements and the capacity of the buyer to put it into production.

During negotiations, the intermediary can serve to move things along. This includes accurately representing the positions of both sides, coordinating the differences in opinions between the two sides, getting rid of elements of confusion in the views of both sides, and making the contract provisions and rights and responsibilities clear. The brunt of their work lies in forming a clear contract that is easy to carry out and in keeping to principles that are beneficial to both sides, and to reach a moderate price.

After the negotiations, the intermediary can manage the execution of the contract. This will include periodic inspection regarding the execution of the contract by both sides, to arranging for new negotiations regarding arrangements not completed, and aiding in solving problems with new technologies that have just come out and with rights and interests. The focus of work is in guaranteeing fulfillment of the contract.

4. Some people felt that, regarding pricing structure factors and pricing principles for technical commodities, the price of technical commodities should be determined by their value. There are also those who feel that the price of technical commodities is determined by use value. Still others feel that, according to the view of Engels, price is the combination of the labor expended and usefulness, so that the price of technical commodities will both reflect the actual expenditure of manufactured commodities and will also reflect the relation between this kind of commodity production and usefulness.

Some people feel that the labor in producing technical commodities, which is characterized by complexity, creativity, exploration, and optimization, is just that particular labor of technical commodities that determines the particular labor times for technical commodities that are most practical and that meet the needs of society, which is equivalent to the time of socially necessary labor, so the particular values of technical commodities represent their social value. The value of technical commodities is a combination of partially formed values and potential value. The use value of technical commodities is characterized by formlessness, proliferation, flexibility, permeability, and sharing.

Some felt that pricing factors for technical commodities include: the value of the transformation in the labor consumed to transform matter, the new value created by the research labor of scientists and technicians, the value added to technical commodities by scientists and technicians, the new value created by technical commodities acting as direct essential factors in production forces, and the accumulated new value created by technical commodities during their life span.

Finally, some people have described theoretically the determining factors that set the monopoly price of a technical commodity. They believe that: the price of a material commodity is determined by its value, which is to say that its price must be near its value. However, technical commodities differ, and as Marx pointed out: "If we are to make the price for the mutual exchange of commodities be approximately in compliance with their value, we need only: 1. in the exchange of different commodities, there should not be the purely fortuitous or the merely temporary; 2. as far as direct commodity exchange is concerned, these commodities would be manufactured in quantities that for the most part meet the mutual needs of each party; 3. in regard to sales, there would be no natural or man-made monopoly that could allow one of two parties to have a greater value in sales, or that would force one party to sell at a lower value." Marx has pointed out very clearly that only if the three conditions just described are met at the same time can value determine or regulate price. But technical commodities cannot satisfy those three conditions because technical commodities are monopolistic, and these prices

that are formed from monopolies are called monopolistic prices. These monopolistic prices are determined by the needs of the buyer and the capacity to pay.

5. Supporting policies for the buyer, the seller, and the intermediary, and especially for the intermediary, should be particular and should be implemented quickly.

The "intermediary" in technology trade activities is an important link in technology trade and will play an ever more important role in changing the small producer mode of selling one's own produce, and in the development of socialization and modernization. We should clarify its nature, affirm its position, and strictly distinguish it from the so-called "fly-by-night companies." Chief among problems currently in urgent need of resolution are: 1. the problem of tax revenue. Intermediaries in technology trade should not be considered to be the same as general commercial enterprises. Some areas levy taxes of all sorts and also command supplementary "tax payments," where after having paid their taxes many intermediaries have nothing left, which obstructs the development of technical trade activities, and even affects the existence of the intermediaries themselves. To encourage technology trade activities, we should give preferential treatment in deferring taxes on profits of intermediaries. 2. There should be reasonable remuneration for intermediary units in technology trade and for intermediaries in intermediary units, and we should make it clear that this remuneration does not count as part of the total bonuses for the unit in question. 3. Intermediaries should be given a definite position in appraisal listings of technical titles. 4. Management of technology markets at every level of governing departments should be invigorated, but they should not govern too closely. Intermediary organizations should both be guided and supported and authority over them should be streamlined and loosened up to aid in freeing things up and enlivening things.

In addition to this, regarding the spare time technical work and consulting services of scientists and technicians, some areas have formulated, without authorization, some policies that run counter to the "Resolution" of the Central Committee, flagrantly limiting them. There should be appropriate methods to correct this.

6. Some participants of the conference pointed out that as far as trends in the development of the technology markets are concerned, at the same time as they cater to small and medium enterprises and to town and township enterprises, the absorption of technology by large enterprises should be considered. There is great potential there, for many large enterprises are in urgent need of developing new products and have as well the capacity to buy new products and new technology. But the technology of domestic research organizations is largely incomplete, cannot meet the needs, and has attracted our attention. At the conference, they also discussed the necessity for, the possibilities for, and realization of technology imports.

12586
CSO: 4008/2102

NATIONAL DEVELOPMENTS

GUO SHUYAN ON OPENING UP TECHNOLOGY MARKET

Tianjin JISHU SHICHANG BAO [TECHNOLOGY MARKET WEEKLY] in Chinese 18 Mar 86 p 1

[Text] Speaking at the First National Technology Market Work Conference, Guo Shuyan, head of the National Technology Market Coordination and Guidance Group and deputy director of the State Science and Technology Commission, pointed out that in order to promote the healthy growth of technology market, it is necessary to increase the understanding of the importance of developing technology markets and draw several distinctions on the limits of policy. He also stated that the position of the party's Central Committee and the State Council toward making commodities out of technical products and developing technology markets is positive. Leading comrades of the Central Committee have given the program full, firm, and enthusiastic support. Comrades of various departments and areas have full confidence in the development of technology markets and must not waver in any way. They must be fully aware that opening up technology markets is by no means an expedient measure. Furthermore, it does not merely open up a source of revenue for the scientific and technical units and increase the income of scientific and technical personnel, but it should be elevated to a high level of awareness in implementing the strategic policy which specifies that "in economic construction, it is necessary to rely on science and technology, and scientific and technical work must be geared to the needs of economic construction." We must increase our sense of responsibility and urgency in doing a good job on developing technology markets. We are doing something which our predecessors have never done before. We are taking on a glorious and historic mission, and we are disseminators of new forms of productivity.

Comrade Guo Shuyan stressed that in our understanding, it is also necessary to make clear the following distinctions on the limits of the policy:

Make clear distinctions between such activities as technology transfer, technical consultation, technical service, technical training, technical contracts, technology share buying, and participation in scientific research and educational and joint-production organizations sponsored by scientific research units, colleges, universities, and industrial and mining enterprises and those activities, such as businesses conducted by party and government organs and cadres, that engage in rebuying and reselling, and use their power for personal gain.

Make a clear distinction between the proper remunerations received by scientific research units, universities, and colleges for setting up technology development organs or the intermediary organs for engaging in technology transfer and other technology-related activities and the business activities carried out by those who are engaged in technology transfer and technical consultations under the guise of technology development, but who are actually engaged in unauthorized purchasing and selling at a profit. Draw a clear distinction between those who receive renumeration in accordance with the state stipulations on technology transfer and those who concoct various pretexts and divide public funds or material things secretly.

Draw a clear distinction between the proper income earned by scientific and technical personnel who take a legitimate part-time job on the premise that they complete their regular work and do not infringe upon the rights of their own units and the suddenly acquired huge profits obtained without authorization by those who neglect their own work and infringe upon the rights of their own units.

When touching on the question of legislating technology markets, he also stated that the "Technology Contract Law," the drafting of which was led by the State Science and Technology Commission, has been submitted to the Legal Bureau of the State Council and the Legal Committee of the National People's Congress following discussions at various levels. With the "Technology Contract Law," it is possible to settle all kinds of contracts concluded on account of technology development, technology transfer, and technical service, thereby solving the existing problems such as the rights and obligations of the interested parties being ambiguous, responsibilities being undefined, the rights and interests of the buyers, sellers, and intermediaries being unprotected, and technology contract disputes having no law to serve as a basis for settlement.

The "Technology Market Control Provisional Measures" discussed at the meeting constitute another important law. The main purpose of formulating this measure is to make technology markets in the country involve in some of the major problems, such as the nature of technology trade, scope of business, management of development and business organs, and distribution of rights and to unify them, thereby changing the phenomenon of too many departments in the government as in the past. As to the question of drawing renumerations from technology income, the Ministry of Finance issued a document in December last year, making it possible for the principle stipulated in the State Council's "Provisional Measures Governing Technology Transfer" to be implemented.

In addition, Comrade Guo Shuyan gave his views on building a sound organization, doing a good job on developing complete sets of technology, taking a firm hold on statistical work, and developing and launching theoretical research projects.

12949/7358
CSO: 4008/2098

NATIONAL DEVELOPMENTS

SCIENCE, TECHNOLOGY SHOW GREAT PROMISE IN HELPING POOR

Tianjin JISHU SHICHANG BAO [TECHNOLOGY MARKET WEEKLY] in Chinese 18 Mar 86 p 1

[Text] Within the country, the reliance on science and technology to enable the poverty-stricken areas throughout the country to get rid of poverty and become prosperous has become a major question for discussion in contemporary China and has a major economic and political significance.

After the plenary session of the party's Third Central Committee, a pleasant change has taken place in our country's rural areas, and the majority of the peasants have begun taking the road to prosperity. However, there are a considerable number of localities which still have not fundamentally rid themselves of the poverty status and are still relying on simple and strenuous labor. Their mode of production is quite backward. Such a situation has seriously impeded the economic growth of these areas and it must be changed.

According to a survey made by departments concerned under the State Scientific Commission, during the "Sixth 5-year Plan" period, relying on science and technology to help the poor, the Taihang Mountain Region invested 7.1 million yuan and earned 270 million yuan from the benefits of increased output. The average per-capita income in the region increased from 75 yuan in 1981 to over 300 yuan in 1985. In using science and technology to develop the mountain regions, five provinces--Ningxia, Guangxi, Anhui, Hebei, and Heilongjiang--invested 16 million yuan and increased their output value by as much as 167 million yuan, 10 times their investment. Practice shows that by relying on science and technology, it is truly possible to change the social life in the poverty-stricken areas within 3-5 years.

The use of science and technology to put an end to the backwardness of the mountain areas requires a group of aspiring scientific and technical workers to go to the lower levels and pass on their scientific and technical knowledge to the peasants and help those regions survey their resources, funds, environments, and markets; formulate or check and rectify their development plans, their development projects, and implementations of the last 2 years; set up demonstration points; and sponsor relevant short-term classes to train some of the local cadres and outstanding young intellectuals so that they can become leaders in the program of using science and technology to achieve prosperity.

In order to transmit technology to the poverty-stricken areas, it is necessary to proceed toward the direction of a overall system. It requires scientific and technical forces with many disciplines and many specialists to give support. It needs the support and help of the developed coastal areas. This program must be carried out through all kinds of channels and requires organization and leadership; it must also be assured of funds from the organizational leadership.

In using science and technology to help the poor and develop the mountain regions, not only do we need support from outside, but, more important, we must also tap the potential of these poverty-stricken areas. Therefore, we must form a science and technology system by which all the people, collectives, and individuals develop simultaneously; set up scientific/technical households, specialty households, scientific-technical linking households, and science and technology organizations which emerge in a combined form and are organized and built with funds raised by the peasants; and allow science and technology to go deep among thousands upon thousands of households in the rural areas, enabling the peasants to get the benefits from science and technology.

Economic growth achieved through the use of science and technology is a major strategic measure for the development of science and techology at the present time. This program can make it possible for the peasants in the poverty-stricken areas to take the road to prosperity. Through science and technology, it permits the economy and ecology there to form a good cycle and proceeds to propel the growth of the whole social economy. This is also a program with a bright future. We wish that the scientific and technical workers dedicated to rural construction would take an active part in this great work and make an effort to change the conditions in our country's poverty-stricken areas.

12949/7358
CSO: 4008/2098

NATIONAL DEVELOPMENTS

PROSPECTS FOR PROVINCIAL 'SPARK PLANS' DISCUSSED

Shenyang LIAONING RIBAO in Chinese 6 Apr 86 p 1

[Text] As the "spark plans" have spread throughout the Liaoning countryside along with this year's document No 1 from the CPC Central Committee, farmers have been thinking and dreaming about "spark plans," as for example with the 50 "spark plans" currently throughout the province (including 22 national projects), which were formulated at the 4-day provincial rural science and technology working conference, and which are being implemented.

At this conference it was determined that the first group of 50 "spark plan" projects to be implemented throughout the province during the "7th Five Year Plan" will take the current situation regarding the countryside and science and technology development in this province into consideration. They would be based on resource and technology advantages and economic capacity within the province, and would be characterized by little investment, short turn-around, suitable technical advancement, and high economic results. Overall, they may be divided into 10 major categories of aquaculture, raising a variety of fine products from domestic fowl, intensified processing of agricultural by-products, a complete set of products serving large industry, etc. Throughout the plan, a group of representative practical technology projects will be developed through the training of a number of talented people, who will set up some township and town enterprises for demonstration purposes. They will disseminate applications on an even greater scale to drive on the full scale development of the rural economy.

After these 50 "spark plans" have set the whole province on fire, picture after beautiful picture and group after joyful group of figures will emerge before our eyes:

Twenty different complete technologies and equipment suited to the countryside will have been developed and will have formed the capacity for batch production, which will have met the needs of the countryside throughout the province and even the nation;

Eighty modern township and town enterprises and small to medium enterprises of a science research production and operations type that are technologically

exemplary will have realized per capita output values of 10,000 yuan and more, and the demonstration and dissemination radiating area of each enterprise will include at least five other enterprises;

Fifty thousand key agricultural elements and various management cadre, as well as intellectual youth with high school educations will have received training in rotation. Intellectual youth engaged in township and town enterprises and those who have a high school education will have mastered one or two technical skills to become the key powers in township and town enterprises and agricultural production;

There will appear a number of a new type embryonic market towns with Chinese urban characteristics, and many farmers who will have broken off from cultivation will become workers in the new industries, their income greatly increased;

Annual output value will be nearly 500 million yuan, with average yearly revenue from taxes of 140 million yuan, and 15 projects will have either earned or saved 14 million yuan for the state.

This conference was convened jointly by the provincial science and technology commission and the provincial science association. At the conference, Li Zemin [2621 3419 3046] and Lin Sheng [2651 5116] spoke, representing the provincial science and technology commission and the provincial government, respectively, demanding that the party committees and governments at all levels strengthen their leadership, that through concerted efforts, relevant departments earnestly organize and implement "spark plans," and integrate these plans with the "one, two, three projects" just now unfolding, to persist for several years, and achieve results.

The conference also commended the science and technology work done over the last 2 years in the countryside, especially in organizing and implementing the "one, two, three projects" and 72 advanced groups and 2 advanced individuals who made outstanding contributions in promoting the spread of science.

12586
CSO: 4008/2106

NATIONAL DEVELOPMENTS

FUJIAN TECHNOLOGY TRANSFORMATION PROJECTS DISCUSSED

Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 20 Apr 86 p 3

[Report by Gong Gao [0180 4473] reprinted from the FUJIAN RIBAO: "Over 5 Years Fujian Has Implemented More than 5,000 Technology Transfer Projects"]

[Text] In an effort to improve economic results, Fujian Province has undertaken an energetic technical transformation of its existing industries and enterprises. For 5 years now, more than 5,600 renovation or transformation projects have been arranged, and more than 2,500 have gone into production. Based on a survey and materials analysis, of the increased industrial output value in Fujian Province during the "Sixth 5-Year Plan," about one-half was realized because of technology transformation. This was very important in changing the situation in Fujian Province whereby equipment in existing industries was obsolete, products were ageing, and techniques were behind the times.

During the last 5 years, nearly 1,000 textile industries have benefited from the measures. This has allowed more than 2,100 renovation and transformation projects in Fujian to be constructed and to go into production, and has also allowed a greater strengthening of production capacity for cotton spinning, machine processed sugar, television sets, chemical fibers, washing machines, and printed and dyed cloth. This has not only better provided for the needs of the marketplace, but has also played a definite role in changing the unreasonable structures in the situation in Fujian whereby "heavy industries are too heavy and light industries are too light."

Over the last 5 years, the energy industries of electric power and coal mining have completed 268 renovation and transformation projects. Through transformation, there have been great improvements in the amounts of coal mined and the capacities of power generated, as well as in production of steel, concrete, and fertilizer. Fujian Province has also stressed close attention to renovation and transformation through a group of energy conservation projects. Those conservation measures and projects already in production can save more than 90,000 tons of coal and 250,000 kwh of electricity annually. Consumption of coal by small fertilizer businesses for each ton of ammonia decreased by more than 800 kg, and electricity consumption for each ton of ammonia dropped more than 200 kwh.

Since 1979, Fujian Province has actively imported foreign advanced technology and equipment to promote the technical transformation of enterprises. Throughout the province, 670 projects have been authorized, more than half of which have gone into production. Electronics industries have imported 33 assembly or production lines, and have undertaken the technical transformation of 108 plants throughout the industry.

12586
CSO: 4008/2106

NATIONAL DEVELOPMENTS

REPORT ON ECONOMIC DEVELOPMENT IN GUIZHOU MOUNTAIN REGION

Tianjin JISHU SHICHANG BAO [TECHNOLOGY MARKET WEEKLY] in Chinese 18 Mar 86 p 1

[Article by correspondent Lin Shuangshuang [2621 3642 3642]]

[Text] Following 1 year of practical work, gratifying initial results have been achieved in the overall technical development of Guizhou mountain regions. Last year, their first group of some 20 recent projects--including crop planting, animal breeding, forestry, fruit and vegetable production, farm produce processing, and mining--produced a total output value of 12,416,000 yuan, a net profit of 4,547,200 yuan, and 65,400 yuan in taxes. At present, they have developed 1,513 specialty and key households, sponsored 714 techical training classes, and trained 55,850 people, thus establishing a technical reserve.

Guizhou Province has designated four counties--Qinglong, Puding, Yuping, and Luoding--as experimental counties for the development of overall technical development in the mountain regions. Last year, using available basic data, the various counties analyzed their conditions, studied the special characteristics for development, and drew up overall plans for overall technical developments in the mountain regions of each county. Good results have been achieved after 1 year of practice. Qinglong County has determined the flotation of low-grade antimony as a focal point in its overall plan for the technical development of its mountain regions. It established the Qinglong County Flotation Plant employing the smelting technology from Guangdong. At present, the plant is processing 30 tons of ore a day and can produce 4 tons of powdered antimony sulfide a day with an output value of 10,000 yuan. The grade of antimony after the flotation process is over 60 percent and the recovery rate is more than 80 percent. As of December last year, the plant has processed 420 tons of crude ore and turned out 70 tons of powdered antimony with a grade of over 60 and an output value reaching 196,000 yuan. It is estimated that the annual output value of the antimony flotation plan can reach 1 million yuan.

Puding County began carrying out its overall technical development plan for the mountain regions in May last year. By the end of last year, according to statistics compiled on seven development projects, investments totaled 133,000 yuan; output value, 611,500 yuan; taxes and interest, 18,600 yuan;

net income, 178,000 yuan; and the ratio of input and output, 1:46. Yuping County closely linked the work on technical development in the mountain regions with the work on helping the poor and actively organized the peasants of the Zhangzhai Administrative Village in breeding hogs in a scientific way. After 1 year of effort, 33 households engaging in scientific hog breeding not only paid back to the county's civil administration bureau 30,000 yuan in relief funds but also reported an average household income of 860 yuan. Luoding County employs the development of early vegetable crops and the cultivation of vegetables in large green houses as the focal point of its overall technical development program for the mountain regions. The county has initially set up vegetable crop bases. In 1985, the sown acreage of early vegetable crops reached 7,600 mou; the total yield reached 13 million catties; the total income was 2.3 million yuan; and the average income per household was 610 yuan. This item alone has enabled 10 percent of the country's peasant households to rise above their poverty.

12949/7358
CSO: 4008/2098

HAINAN REPORTS INITIAL RESULTS IN FOREIGN IMPORTS

Tianjin JISHU SHICHANG BAO [TECHNOLOGY MARKET WEEKLY] in Chinese 18 Mar 86 p 4

[Text] During the Sixth 5-Year Plan period, Hainan Island has accelerated its imports of foreign capital and technology. The annual use of foreign capital has increased two times as compared to the preceding year. In 1985, it signed 90 contracts with foreign firms. The amount of investment called for in the contracts reached $58.78 million, and the amount of foreign capital used came to $23.7 million, representing 62 percent of the total amount of foreign capital used during the Sixth 5-Year Plan period. During the past 5 years, 147 joint enterprises established with foreign capital on the island have either gone into production or are still under construction. They are playing a role in propelling the island's economic growth with remarkable results.

The Dingan Nylon Zipper Plant jointly operated by the Hainan Joint Trading Company and Hong Kong business firms has imported a nylon zipper production line with an annual output of 16 million meters of zippers. The zippers turned out by the production line is low in cost and excellent in quality, and the various indexes exceed the standards set by the state. The leather goods turned out by the Nanming Leather Product Company, Ltd., which is jointly operated by the Haikow Leather Factory and the Jianming Foreign Firm of Hong Kong, are sold in the United States and Canada, earning $570,000 in foreign exchange from export. Products from the Wenxing Electric Wire and Cable Plant in Wenchang have earned from export trade $420,000 in foreign exchange in July alone. All the products from this plant are exported to Hong Kong and the Middle East area.

Simultaneous with the importation of all kinds of advanced technology and equipment, Hainan Island also pays attention to cooperating with technically advanced units within the country. After importing six sets of vulcanizing equipment from Japan in 1984, the Haikou Tire Plant engaged in technical cooperation with the Great China Tire Plant in Shanghai to break the quality barrier, and its products are not only selling well in the country but are exported to foreign countries. Its products are included in the light industrial product export plan of Guangdong Province. At an exhibit held in January this year, foreign businessmen ordered at one time to purchase 5,000 sets of tires produced by this plant.

Hainan Island is situated in the tropics, which is ideal for developing tropical economic crops. However, owing to the backwardness of original production technology, some of the tropical economic crops were poor in variety. The yields were low and had no competitive capability in the international market. During the past few years, Hainan Island has been actively importing improved varieties and gradually spread the production of tropical economic crops. In the Chengmai Oil Palm Plantation Company's oil palm projects using foreign capital, our side provided 120,000 mou of land, while foreign firms invested $30 million. At present, 30,000 mou of fine-variety oil palm trees have been planted and 320,000 seedlings are being cultivated. The oil palm trees planted earlier are blossoming and bearing fruits and growth is vigorous. The survival rate of euphatorium chinensis planted on a trial basis by the Eupatorium Chinensis Plantation jointly operated by the the Wanning Perfume Industry Company and the Felton International Perfume Corporation of the United States has reached 99.8 percent. Both parties in the joint venture are in the process of negotiation to sign a contract for cooperation on large acreage. The aloe experimental farm operated by the Zhanxian Agricultural Development Company in cooperation with the United States has also produced gratifying results. The newly imported improved coconut variety is expected to produce a harvest after 3 years, producing a crop 5 years earlier as compared to the local variety.

Hainan Island is surrounded by sea and its coastline is 1,700 km long. It has about 380,000 mou of shallows, 68 large and small harbors, and huge fishing grounds. Since 1980, the Hainan district has imported equipment and technology for catching lobsters alive and for breeding groupers and other seafoods and carried out 16 fishery cooperation projects, including angling and deepsea fishing operations. Most of the products are exported. The autonomous zhou and Lingshui County Development Companies separately cooperated with Japanese firms in pearl culture projects. In cooperation with Hong Kong firms, they also breed groupers with netted enclosures in Xincun Harbor and have attained good results. Nine months of breeding netted them 15 tons of groupers, most of which were sold in Hong Kong markets. Recently, the Southsea Marine Product Company cooperated with a company jointly operated by Japan and Hong Kong in actively developing deepsea fishing.

The Hainan Administrative District has made an excellent beginning in its foreign economic activities. Along with the implementation of preferential policy regarding foreign business activities, the "Pearl of the South Sea" will make still greater contributions to the "four modernizations" program.

12949/7358
CSO: 4008/2098

NATIONAL DEVELOPMENTS

HUBEI'S TECHNOLOGY MARKETS LINKED TO PRODUCERS

Tianjin JISHU SHICHANG BAO [TECHNOLOGY MARKET WEEKLY] in Chinese 18 Mar 86 p 4

[Text] Hubei Province's technology markets have achieved excellent results in establishing a way to link technology producers with technology consumers, thus solving the problems of purchasing and selling technical products.

Technology markets in the cities and counties of Hubei are located at a distance from the major technical product manufacturing centers, and the technology markets in the large and medium-size cities in the province and Wuhan are also far away from the technology users scattered in the counties, districts, towns, and hamlets. This has caused difficult problems for the technology markets at all levels in "purchasing" and selling."

In order to solve the "purchasing" problem, they concluded bilateral or multilateral agreements with the technology markets in Shanghai, Beijing, Shenyang, Fuzhou, Nanjing, Chongqing, and Xi'an concerning intermediary joint operations and the exchange of information regarding the supply and demand for technologies, forming a network using the Wuhan Science and Technology Development Center as the transfer point, from which the information is transmitted to the major technology markets throughout the country. They have established regular ties with universities and colleges, scientific and technological units, and technology development organs in and outside the province and made them their local technology commission agents, thus forming a network through which the markets in various localities directly reach the "technology-producing areas." Universities and colleges and scientific research units in some 20 provinces and municipalities hired technical advisers and information personnel, thus forming a network linking technology markets with technology producers.

In order to solve the difficult problem of "sale," technology markets in Hubei have strengthened their ties with the enterprises, have an understanding of the enterprises' technical reform plans and needs, established "enterprise business connecting link," and set up technology market points linking the enterprises and regional market network. As to some of the projects that are highly specialized and technologically difficult and produce beneficial results when put into production, they circulated a notice in the trade and

then guided the factories in selecting the items. Through the setting up of permanent technical firms, they also sponsored mobile technology markets, technical fairs, and technology trade negotiation meetings and took their technologies to the villages and factories, allowing the users to select and purchase the new technologies and setting up a way to keep contacts with the consumers. They also made as key points the support of enterprises in stepping up their expansion of production, technical transformation of old enterprises, conservation of energy, reduction of consumption, and upgrading of product quality and gave priority to providing the enterprises operating at a loss with technical assistance to increase their profits or switch to other lines of production.

12949/7358
CSO: 4008/2098

NATIONAL DEVELOPMENTS

LIAONING'S TECHNICAL ADVANCES DISCUSSED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENCE OF SCIENCE AND MANAGEMENT OF S&T] in Chinese No 2, 1986 pp 2-3

[Article by Yang Jianzhang [2799 1696 4545]: "Technology Introduction into Liaoning"]

[Text] The history of economic construction and of the development of S&T in many countries has made clear that the importation of advanced technology from abroad played an important role in the promotion of technical progress and the rapid economic development of those countries. This is precisely the reason why in our country people from the central to the local governments pay great attention to the work of technology importation and the development of equal and mutually beneficial trade and trade contacts.

Along with the implementation of the party's policy of opening to the outside world and stimulating the economy within the country, Liaoning has accelerated its speed of technology importation. In the period from 1979 to 1984, through processing and assembling, joint production, compensation trade, joint ventures, equipment leasing, and foreign loans, technology importation has been discussed and technology exchange was conducted with enterprises and businesses from more than 30 countries and districts such as Japan, Italy, West Germany, the United Kingdom, Switzerland, France, Sweden, Denmark, Spain, Belgium, the United States, Holland, Canada, Australia, and Hong Kong; 1,486 transactions were concluded to an amount of $722 million. Of the 1,486 transactions, 753 transactions involved the direct use of foreign capital, which amounted to $325 million. The focal points of technology importation were in municipalities such as Dalian, Shenyang, Dandong, Benxi, Fushun, Jinhou, and Yingkou and in the areas of light textiles, electronics, metallurgy, petrochemical engineering, transportation, aquatic products, and construction materials.

From the development of technology importation in Liaoning in the past few years, we have observed the following clear tendencies:

1. Importation is accelerating and the scope is expanding. In 1983 and 1984, 1,054 transactions of technology importation from abroad were concluded with the signing of agreements amounting to $360 million, which is 49.8 percent of the total value concluded in the 6 years from 1979 to 1984. In 1984 alone, 818 transactions were concluded. The time spent from

negotiation to the signing of an agreement of a transaction is being gradually shortened. Last year, many items were established, the work started, and the transaction concluded in the same year. The Benxi Synthetic Fiber Plant introduced from West Germany a complete plant of one-step long-filament textile machinery and it took only 3 months from the establishment to the conclusion of the transaction.

2. The targets of cooperation are expanding; there were only a few countries and districts in the beginning and there are more than 30 now. In the past few years, owing to its historical and geographic factors, public feelings, and transportation, the total amount of technology importation into Liaoning from Japan and Hong Kong ranks first, at about 73 percent of the total amount of technology imported into the province from 1979 to 1983. Since last year, technology importation from Western Europe and North America has been increasing, especially knowledge-intensive technological and large-scale technological equipment.

3. Methods of importation are varied and direct investment is increasing. In the beginning years, the methods and channels of technology importation were monolithic, and most of the deals concluded were for the processing of materials from abroad or assembling of parts of components from abroad. In the past 2 years, it has developed from the utilization of funds from foreign loans in the Bank of China to the direct use of foreign investment, from processing foreign materials or assembling foreign parts to rental of equipment and joint production and, further, to the direct use of foreign investment such as joint ventures. For example, between 1979 and 1983, the two items of compensation trade and processing and assembling amounted to 59.25 percent of the total of technology imported; it dropped to 31.5 percent in the period between January and September last year, while direct investments such as joint ventures, joint production, and equipment leasing have increased from 32.17 percent to 65.5 percent in that period, which is more than a twofold increase.

4. It is progressing from the introduction of single pieces of equipment (hardware) to a planned and systematic complete set of equipment to a product line and then toward the direction of importing production blueprints, technology, and management software. Items of mainly software technology introduced last year amounted to one-third of the total. Most of the enterprises also imported whole sets of technical blueprints and papers and the techniques of management as well as equipment.

The situation mentioned above indicates that the work of technology importation has not only made a good beginning but also has made good progress.

In our investigation in Shenyang, Benxi, and Dandong, we noticed that in technology importation, some enterprises which did well in the digestion and absorption of technology and acquired obvious economic results have paid attention to the following things:

First, there was a definite technology target and the study of feasibility was stressed.

Second, the introduction of modern management was stressed to learn management principles and experience from the other party.

Third, the introduction of modern management was stressed to learn management principles and experience from the other party.

Fourth, the imported technology was combined with research to tackle S&T.

Fifth, environmental protection ability and the ability to fit locally are attended to.

12909/9738
CSO: 4008/2087

NATIONAL DEVELOPMENTS

LIAONING'S FUTURE AS S&T DEVELOPMENT AREA DESCRIBED

Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 3 May 86 p 1

[Report by Liu Yuqin [0491 3768 3830], et al.: "Liaoning Picked As Focus for National Technology Transformation; Will Build a Modern Industrial Base Area Within Fifteen Years"]

[Text] During the 15 years from this year until the end of the century, Liaoning will construct an open, modern industrial base area that is centered on heavy industry, where agriculture develops in coordination with heavy and light industry, and which is culturally rich.

This was proclaimed by the Liaoning deputy governor, Zhu Jiazhen [2612 1367 3914], representing the provincial government at the recent third Liaoning Conference for Technology Advancement.

Implementation of this development strategy will be in two steps: in the first 5 years restructuring of the economic system will be accomplished, relations will be established, and the foundation will be set; in the latter 10 years the role of the technically transformed traditional industry will be fulfilled, advanced world technology will be used, development of rising new industries will be hastened, and the economy will be in full bloom.

Deputy Governor Zhu Jiazhen said that from now on, Liaoning will break down fractionalism, will strive to accelerate and develop lateral economic relations, will develop various types of industrial groups, and will move the combined operations in Shenyang, Dalian, and Jinzhou into new levels; based on the structural characteristics of the provincial industries and on the energy and transportation situation, Liaoning will actively develop fund raising and compensation trade; at the same time as we develop the dominant steel, petroleum, and chemical industries, we will also develop relatively stable areas for providing non-ferrous metals, lumber, and coal outside the province.

Zhu Jiazhen said that the state has already named Liaoning as a focus for technology transformation during the national "Seventh 5-Year Plan," where investment in technology transformation will grow by 64.1 percent over that of the "Sixth 5-Year Plan." The emphasis in the technology transformation will be in energy, natural resources, mechanization, electronics, and textiles.

12586
CSO: 4008/2110

TIANJIN TECHNOLOGY MARKETS DISCUSSED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENCE OF SCIENCE AND MANAGEMENT OF S&T] in Chinese No 3, 1986 pp 32-34

[Article by the Technology Market Survey Committee of the General Office of the Tianjin Municipal Science and Technology Commission: "A Survey Regarding Expediting Development in Depth Tianjin's Technology Markets"]

[Text] Tianjin was one of the earliest regions in China to open up its technology markets. According to incomplete statistics, there are at present more than 570 "centers" or "companies" throughout the city concerned with science and technology (150 are licensed), 314 of which are purely intermediary. The forms of ownership for these structures include public and group, as well as individual. The primary scope of operations include: technical services, technical consulting, technical cooperation, transfer of rights to achievements, provision of information, bidding out of difficult problems, technology contracts, and the exchange and training of personnel. Of course, there are other modes and channels in circulation, and technology markets are currently deliberately becoming an important component of the socialist unified marketplace.

The commercialization of achievements in technology and the opening of the technology markets have changed the operational systems of science and technology and have brought on technical advances in small and medium enterprises and in township and town enterprises; the phenomenon has impelled research organizations to change from closed models to open ones; it has enhanced internal vitality within research units and higher level institutions, and has motivated the enthusiasm of very many scientists and technicians; it has accelerated intellectual activity; and it has begun to employ personnel who are skilled at managing technology products.

The technology markets exhibited a great vitality even upon their initiation, but due to lack of experience there could not but be new situations and problems. From the prospective of this city, the primary problems at present in the technology markets appear in the following areas:

1. Examination and approval, and management problems among technological operational structures. At this moment, the major problems in management are: because of lack of manpower and narrow sense of business, industrial

management departments lack power to supervise and manage technology markets; some management departments tend to be slack about applications within the system to set up "centers" or "companies"; some leading cadre do not act in accordance with the rules of examination and approval, allowing some "centers" and "companies" that do not comply with regulations to be licensed. From the point of view of the operational scope of technology markets, some technology trade organizations actually run wholesale and retail businesses for products in kind. Worthy of note is that there are currently some units that have no technical basis whatsoever, nor do they themselves understand technology, but run technology service companies on a professional basis; and particular scoundrels have been discovered who in the name of "centers" or "companies" engage in speculation and profiteering. In addition, there are also some criminal elements who in the name of "transferring the rights to technologies" cause township and town enterprises to sustain economic losses.

2. The problem of guidance for technology markets. At present, the technology management structures in this city are fulfilling the role of "handmaidens" as they provide the necessary function of go-betweens for two parties. But they do not fulfill their rightful roles in the appraisal of sale of the rights to technology and in examination of the qualifications of the seller. From the point of view of the situation among research units and higher institutions, for the purpose of a greater income, some units seldom consider the problem of rational distribution in regional production when selling rights to technology. Beginning this year, there were some things worth noticing in the technology markets, namely, that with a sudden drop in the number of technical achievements, many technology management organizations suffered from a feeling that "business is bad." Reasons leading to the problems just described are chiefly in the fact that in the past, township and town enterprises took on some achievements that were not ready, difficult to put into production, or even deceitful, which to a certain degree affected the reputation of the technology markets. Also, there were not many achievements left in the last couple years to be sold or which were up to standard, which kept medium and large enterprises from making many inquiries of the technology markets.

3. The problem of the function of government-run technology management organizations. Government functionary departments have successively opened some "centers" or "companies." In terms of direction, should this sort of technology trade organization focus on service or on operations? This is a question often discussed by everyone. Some technology operations organizations are designated as business units, but they are still expected to operate as enterprises, from which managing departments will deduct a percentage. This presses them to think of ways to earn money to support themselves, and so move toward concentrating on operations. Therefore, in the current situation, the nature of these "centers" or "companies" is worth exploration, as is their position and function among all technology markets.

4. The problem of allocation policies. To encourage scientists and technicians in developing new products and new technologies, and to encourage engagement in consulting and technical services, there should be permission in policy to deduct cash as a certain percentage of sales or consultant fees (not including total bonuses) to encourage and reward direct participants in

projects. However, because the control of the percentage of the cash deduction has not been uniform within the system, this has resulted in a certain amount of confusion in the technology markets. In 1982, the provisions of document No 024 as issued jointly by the Chinese Science Association and the Ministry of Finance allow 20 percent to be taken from income derived from consulting services (aside from compensation of relevant expenditures) to be allocated to participating and consulting units and relevant personnel, the amount of cash alloted to each individual each month not to exceed 30 yuan; document No 246 signed and issued in 1984 by the Chinese Science Association provided for deduction of a consulting subsidy at from 10 to 30 percent after deduction of a portion of direct expenses from the amount of the consulting contract; among the temporary provisions issued in January 1985 by the State Council regarding the transfer of rights to technology, it was allowed that units transferring the rights to technology could take 5-10 percent of the net income as a reward. Because current allotment proportions are not uniform, some technology operations organizations have found many loopholes and compete with each other to raise the proportions deducted, using the larger amounts to attract scientists and technicians and achievements. Some among these scientists and technicians are prone to go wherever the money is greatest. To be able to get even more money, some institutes and higher institutions get the technology operations organizations to do the paperwork again on projects that have already been arranged with production units, preferring to allow the middle level "take another slice off the top." Some other enterprises will treat the normal cooperation with outside interests and production tasks as technical services in order to get money through basic technology consulting service organizations. Even more insidious, some enterprises have surreptitiously bid up the prices of their own technical achievements in the market.

5. The problem of spare time work for scientists and technicians. Spare time work for scientists and technicians is primarily technical consulting and technical services. Currently, we do not all see eye to eye on the problem of spare time work. In general, department leaders of scientists and technicians do not support spare time work for scientists and technicians. On the one hand, they fear violating the rights of the unit in question, and on the other hand they feel that it might affect the enthusiasm of other scientists and technicians. But technology operations organizations are just the opposite. They do not want to deal with the department leaders of scientists and technicians, and will even keep secrets from them. In this kind of situation, when a certain number of scientists and technicians take on spare time consulting and technical service, they feel that this is unjust; some will not consider this at all, not daring to take on another job; those who do still have doubts.

6. The problem of how to strive for efficiency in technical trade activities. In the last 2 years, all levels from the national to the local level have held trade fairs for technology achievements, which have served to publicize and accelerate the commercialization of technology and the opening of the technology markets. But there have been technology trade fairs that have appeared reeking of empty formalism. To frequently these trade fairs that

waste efforts and money and that bring in few results, have attracted the attention of relevant units, and as some comrades have described, these trade fairs "talk a lot, listen well, and do little."

For these reasons, we offer some thoughts and suggestions for everyone's consideration:

1. Enhance the Unified Management of the Technology Markets

Markets are a mechanism. The technology market is a broad concept. Where there is a place for the flow and exchange of technical achievements, that is a technology market; without a fixed place, the market mechanism still exists, and the technology markets can be of different formats, different levels, and of many channels. They are not the same as markets for industrial or agricultural products, nor having just come into existence have they established a complete management scope. With an eye on enhancing management of the technology markets, this means that we want to control the overall picture while invigorating the lower level. Currently, the first problem encountered is that of managing the system. Because we lack necessary management conditions, those things belonging to industrial administration departments are difficult to manage directly, and we are limited to going through the formality of licensing. Industrial administration departments have great difficulties with this kind of management of special commodities and special markets for technical achievements.

Because many departments are involved in the problems of technology markets, to enhance management we suggest establishing a working conference system for technology market coordination. For example, led by the science and technology commissions and with the participation of relevant departments, commissions, and offices, major matters relevant to the technology markets could be studied, decided upon, or discussed. The nature of the working conference, scope of operations, and operational system, as well as who would participate (appoint specialists to maintain the continuity of the work), would be approved by the municipal government. Normal management and supervision of technology markets could be undertaken by the science and technology commissions, and registration and licensing will still be handled by industrial administrative and management departments. It is not too appropriate that qualifications for the registration and licensing of technology operations structures be completely in terms of the registration methods of services and enterprises (which have fixed areas for production operations and definite people involved in business, required funding, etc.). This should be carried out in view of the characteristics and rules of research to formulate corresponding management rules for technology markets.

2. The Aim of the Technology Operations Structures in Government Systems Should Be to Serve

A socialist economy is a planned commodity economy. Technology markets are the same as markets for industrial commodities and agricultural commodities in that they are a major component of the socialist unified markets, and in that they should manifest the principles that focus on a planned economy with market regulation as supplementary. Therefore, technology trade activities

ought to fit with the overall requirements of national economic development, and should comply with the requirements of the coordinated development of regional science and technology with the economy and society. There are two parts to the technology markets: one is the planned market, that is, the realization of national and regional research planning through public bidding and technical contracts, which is the main part of the technology markets, and which must be strengthened henceforth; the other part is free market regulation. The many technology operational structures currently apparent are an important complement to the planned markets. But leadership for these markets must be enhanced, for otherwise they will harm national planning. But through which departments shall this function be implemented? This should be done chiefly through technology operations structures run by government departments. If these structures become separated from administrative departments too early, and "business" is done through enterprise operations, guidance for technology markets will be lost, and they will not be able to make the most of their advantages. This problem has already arisen among technology operational structures. Therefore, for the time being we must not take on enterprise operations too early, or at least must not do so completely.

There are primarily four "government-run markets" in this city (run by the science and technology commission, the economic commission, the foreign trade commission, and the national defense science and technology industries). In operational scope, the division of labor that they should have for the most part should be closely integrated with the developmental planning of the local areas and departments to exert an unique influence on accelerating the integration of the economy with science and technology. The science and technology commission ought to focus on getting out information, technology development, and on the transfer of rights to achievements, and the economic commission should concentrate on technology transformation; the foreign trade commission should focus on the importation of technology; and the national defense science and technology industries should focus on the transfer of military industrial technology to civilian use. If this is not done, and there is too much overlapping of fields of operation, then there will be a mutual sapping of strength. Naturally, there should be competition between "government-run markets," and between government-run and civilian run, but that competition should be manifest in competition for the quality of service and for reputation.

3. We Must Energetically Foster and Encourage Joint Research and Production Operations

Technology is an intellectual commodity that besides having the attributes of physical commodities has also its own attributes, all of which means that the means by which it circulates will not be the same as with ordinary commodities. For technical achievements to be transformed into production forces is conditioned by many varied factors, and is certainly not just a simple buy and sell relationship.

There are many means and channels by which technical achievements are transferred. But what people are paying most attention to these days are those fixed technology trade structures and irregular technology trade fairs.

Unfortunately, the combined research and production structures that have an even greater vitality have not yet attracted sufficient interest. Combined research and production structures are the most effective form by which to transform science research into production forces. The advantages lie in the fact that they can: overcome the blindness of research in research units and higher institutions, which will lead to "marketability"; research and production units cooperate intimately to share risks and to share in economic results; and they allow enterprises to have a stable technical back-up, ensuring that products will continue to escalate and be renewed, and to improve the competitive capacity of enterprises. The question of combined operations still needs thorough study and a continued review of experiences to formulate city-wide and even national unified policies for encouragement and support, and to urge on the rapid development of combined operations.

4. In Order to Meet the Needs of the Technology Markets, We Must Pay Attention to the Training of Technology Operations Personnel

Whether technology markets can healthily and thoroughly develop depends to a great degree on the quality of technology operations personnel. At present, a contingent has been provisionally formed in this city to undertake technology operations. This group of people have come over for the most part from technical positions and they lack knowledge and experience in the fields of operations. To solve this problem it is extremely important to train a group of science and technology operations personnel who can dedicate themselves to the opening of the technology markets. Aside from training them in actual experience, we should also hold short term classes or establish a relevant curriculum in the higher institutions.

5. We Cannot Treat All the Spare Time Jobs of Scientists and Technicians In the Same Way

There are at present four ways that research units and higher institutions are dealing with spare time jobs:

1) A unit clearly forbids spare time employment, there are internal policies for attracting scientists and technicians, and if an individual feels that he has not been able to fulfill his potential, he may transfer to another unit; 2) where there are few scientists and technicians and there is a great obligation to work and study, units of this sort generally do not support outside spare time employment; 3) many units require that outside employment be handled through the host unit; 4) they neither support nor oppose. Based on these conditions, the following principles may be considered for the problem of spare time employment: allow each unit to make provisions based upon its own actual situation, and do not handle everything "in the same way"; all units that do not permit spare time employment for scientists and technicians should at the same time formulate another policy: permit scientists and technicians who have not fulfilled their potentials to transfer to places where they can; for spare time jobs for scientists and technicians, the employing unit should in principle deal with this through the scientist or technician's host unit; there cannot be egalitarianism in allotments, but rather there should be the principle of more reward for more effort, and the means by which the host unit acts as "verifier" should definitely not be used.

We must strengthen ideological and political work with scientists and technicians and should enhance vocational and moral education to improve organizational discipline.

6. We Should Greatly Enhance the Theoretical Study of Technology Markets

We cannot tolerate neglect of the guiding function that theory holds for actual practice. With the commercialization of technology, the value of knowledge and talent has become apparent. But we must also see that at present there are still many problems of an ideological nature, and that the generation of these problems is to a great extent bound to the confusion in theoretical understanding. Therefore, we must bring along study in a planned way of characteristic attributes of technical commodities, models of technology markets, and the value of intellectual labor, as well as of problems with the property rights to knowledge and the flow of knowledge. We want especially to pay attention to organizing the study of development systems for higher institutions and research institutes.

12586
CSO: 4008/2102

NATIONAL DEVELOPMENTS

YUNNAN'S COMMITTEES COMBINE TO TRAIN INDUSTRIAL LEADERS

Tianjin JISHU SHICHANG BAO [TECHNOLOGY MARKET WEEKLY] in Chinese 18 Mar 86 p 1

[Article by special correspondent Lo Dongbao [5012 2659 1032]]

[Text] Recently, Yunnan's economic and technology committees combined to train in separate group leading cadres of more than 500 large and medium-size industrial enterprises, giving them lectures on the "Chinese Patent Law" and the particulars of its implementation as well as questions concerning pattern application procedures. The first training class concluded at the end of February. The objective of the training program is to enable the leaders of various industrial enterprises to have a better understanding of pattern law implementation and the relationship between the reforms of the economic system and the science and technology system, and to gain the knowledge that implementation of the pattern law can strengthen the technological development capability of the industrial enterprises and is beneficial to technical reforms, the importation of technologies, and technical innovations.

Yunnan's economic and scientific committees issued a joint notice on this matter. The notice specifies that all those who took part in the training classes will be issued certificates of completion which will be regarded as one of the verifications of their profession.

Leaders of various enterprises are positive toward the training and rushed to register for the training program. Leading cadres of enterprises who participated in the first training class said that through the study, they have gained an understanding of the close relationship between pattern work and the technical progress and growth of the enterprises. From here on, they are emphasizing this aspect of work.

12949/7358
CSO: 4008/2098

NATIONAL DEVELOPMENTS

SHIFTING MILITARY PRODUCTION TO CIVIL USE DISCUSSED

Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 23 April 86 p 3

[Report by Zhang Heping [1728 0149 1627]: "Civilian Production From the Ministry of Ordnance System Begins to Show Results"]

[Text] The Chinese Ministry of the Ordnance Industry that in the past manufactured only conventional weapons like artillery, firearms, and ammunition, has for the last few years been moving resolutely toward integration of the military and civilian. There have been initial results in the area of developing civilian production which have showed the tremendous potential defense industries have in serving economic construction.

It has been disclosed by relevant departments that the Ministry of the Ordnance Industries has set up more than 200 assembly lines for civilian use, the number of civilian products having increased from 64 different kinds in 1980 to more than 400 in 60 major categories. In 1985, the output value of civilian goods by the Ministry of the Ordnance Industry was 2.2 billion yuan, which is a 225.7 percent increase over 1980. In recent years, the Ministry of the Ordnance Industry has been awarded silver and gold prizes and provincial and ministerial commendations for more than 70 civilian high grade products. They have exported camera lenses and bicycles to western Europe, the United States, Southeast Asia, and Hong Kong.

Focusing on national construction and on the needs of the people, the Ministry of the Ordnance Industry has developed the advantages of military industrial technology to emphasize development of products with their own characteristics and that are highly technology intensive. Some factories that manufacture firearms have made the most of mechanized processing and assembly to develop motorcycles and bicycles. At present, the motorcycles manufactured by this Ministry have gone from the one model of the beginning to 16 models under 6 brands, and output in 1985 was 130,000 units, which constituted 61 percent of the total output of motorcycles in the nation. Some tank factories produce all kinds of heavy, light, and miniature motor vehicles, as well as railway freight cars, last year alone manufacturing nearly 7,000 vehicles. Large scale weapons plants manufacture the oil extraction shafts, drilling equipment, and hydraulic supports urgently needed by the petroleum and coal industries. The Ministry of the Ordnance Industry also jointly manufactures with departments such as the State Office of Building Materials extraction and

processing equipment for marble and granite, and manufactures products such as photoelectric medical instruments, building machinery, explosives for civilian use, and fire protection machinery.

In the area of developing products needed in the people's daily lives, this ministry has manufactured tens of thousands of high quality durable consumer goods, such as refrigerators, washing machines, and sewing machines.

As they have developed, many enterprises have come to employ lateral economic relations and specialized cooperation. As for example where the Chongqing Jialing Machine Plant has joined with more than 100 enterprises both in and out of the province to form the "Jialing Motorcycle Economic Integrated Group," which has achieved minimum investment, quick speed, high quality, and good results. The Huabei Optical Instrument Plant manufactures cameras and has joined laterally with tens of plants in the provinces and cities of Beijing, Hebei, and Jiangsu. Components are sent out, which has allowed a great increase in camera production, a rise in quality, and a lowering of costs. Only 900 were made in 1982, but the pace was increased in 1985 when 100,000 were made, still unable to meet the demand.

In recent years, the Ministry of Ordnance has imported more than 140 new technologies and assembly lines to bring a certain improvement to the quality and quantity of civilian products. As for example with the production of trucks, where the Ministry of Ordnance has faced the domestic problem of "a lack of heavy trucks and too few light ones." It has made business deals with both American and West German factories to develop 36 and 20 ton heavy duty trucks.

For some years now, the Ministry of Ordnance has also been shifting several hundred advanced military industrial technologies to civilian use, and has trained some technical key elements for local areas.

During the "Seventh 5-Year Plan" the Ministry of the Ordnance Industry will strive to realize the historical strategic evolution of "producing civilian goods while ensuring the completion of military tasks." Civilian use development goals that have been preliminarily formulated include: by 1990, the output value of civilian goods will be 8 times that of 1980.

12586
CSO: 4008/2106

NATIONAL DEVELOPMENTS

PHOTOGRAPHS REVEAL DETAILS OF NEW 'ZHI-8' HELICOPTER

Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE MAGAZINE] in Chinese No 5, May 86 back cover

[Photographs and caption]

On 11 December 1985, a joint effort on the part of the Changhe Aircraft Plant of the Ministry of Aviation Industry and the China Helicopter Design Institute successfully produced the "Zhi-8," a heavy multi-purpose helicopter. The aircraft made its first test flights at Jingdezhen in Jiangxi Province. In response to readers' requests, this magazine is publishing photographs of the "Zhi-8" for the first time.

/6091
CSO: 4008/66

NATIONAL DEVELOPMENTS

BRIEFS

MAJOR SODA ASH PLANT UNDER CONSTRUCTION--Jinan, April 21 (XINHUA)--Construction of China's biggest soda ash plant, which will have an annual production capacity of 600,000 tons, began today in Shouguang County, Shandong Province. The plant, which is expected to cost 570 million yuan to build, is one of China's key construction schemes during the Seventh Five-Year Plan (1986-1990). Officials in this provincial capital said much of the factory's equipment would be imported, and building work was expected to be completed by 1989. Chemical Industry Vice-Minister Wang Min, who attended a ceremony to mark the first day of construction today, said work on another two soda ash plants of similar size, one in Lianyungang city, Jiangsu Province, and the other in Tangshan, Hebei Province, would begin later this year. He said the three plants would nearly double China's production of soda ash, which is used, among other things, in making glass, detergents and cleansers. [Text] [Beijing XINHUA in English 1521 GMT 21 Apr 86 OW] /6091

SINO-AMERICAN ENGINEERING FIRM IN GANSU--Lanzhou, April 22 (XINHUA)--A Sino-American joint venture, the first in northwest China, has been set up in this capital of Gansu Province, officials here said today. The Huakai Engineering Company, which began business operations earlier this month, undertakes projects of petrochemical, natural gason chemical fiber, light and electric power industries. The company is jointly run by Lanzhou Petrochemical Designing Institute affiliated to China General Petrochemical Corporation and M.W. Kellogg Company of the U.S.A. At the moment, the company is holding talks with a fertilizer plant in Hunan Province on upgrading its 300,000-ton synthetic ammonia plant, and helping the construction of an imported PVC resin plant in Lanzhou. [Text] [Beijing XINHUA in English 1124 GMT 22 Apr 86 OW] /6091

MACHINE TOOLS TO BE COMPUTERIZED--Beijing, April 22 (XINHUA)--Beijing Mayor Chen Xitong has told factory directors that they must install microcomputers as far as possible to update their operations, according to today's "Economic Daily." "All factory directors must be aware of the importance of microcomputer technology and try to use it in revamping industrial equipment," the mayor said at an on-the-spot meeting last week. "Otherwise they are not qualified directors." Over the past two years the number of computers installed by the city's industries has been quadrupled to 1,664. And about two-thirds are being used in production. The mayor said that the Chinese capital will computerize 4,000 machine tools in the next five years. [Text] [Beijing XINHUA in English 1523 GMT 22 Apr 86 OW] /6091

PLANS TO DOUBLE CHEMICAL PRODUCTS EXPORTS--Beijing, April 29 (XINHUA)--China plans to double exports of chemical products during the Seventh Five-Year Plan (1986-1990), a Chemical Industry Ministry official here said. To achieve this, the ministry will set up export centers in several large cities, and open plants to specialize in producing goods for export. The first 20 to 30 such enterprises have been planned for eight provinces and municipalities, including Liaoning, Jiangsu, Shanghai, Tianjin and Guangdong, said the official. These will introduce new technology and make every effort to meet international standards in product quality and packaging. [Text] [Beijing XINHUA in English 1048 GMT 29 Apr 86 OW] /6091

QINGHAI POTASH FERTILIZER PLANT--Golmud, May 1 (XINHUA)--Construction of China's biggest potash fertilizer plant started in Qaidam Basin, Qinghai Province, this morning. With a designed annual production capacity of 1 million tons, the Qinghai Potash Fertilizer Plant is a key construction project of China's Seventh 5-Year Plan (1986-1990). The first-phase construction is scheduled to be completed by August 1989 with a total investment of 270 million yuan. The first-phase project includes a processing mill with an annual production capacity of 200,000 tons, a salt mining field covering 9 square kilometers, an ore dressing mill, an equipment maintenance workshop and a power generating plant. The fertilizer plant is built on the Qarhan Salt Lake, the biggest one of the 31 salt lakes in Qaidam Basin. The dry salt lake covers 5,800 square kilometers with a total mineral deposit of 60 billion tons, including potassium, sodium, magnesium, boron, lithium, and bromine. The Qaidam Basin has 97 percent of China's lake salt resources. Developing production of potash fertilizer will not only promote economic development of Qinghai Province, but also grain production of the whole country. Provinces in south China, the major grain producers, used to overstress nitrogenous fertilizer while neglecting potassium. The imbalance has affected growth of farming produce. [Text] [Beijing XINHUA in English 1056 GMT 1 May 86 OW] /6091

SINO-JAPANESE WORD PROCESSORS DUE FOR MARKET--Beijing, April 22 (XINHUA)--A word processor able to produce Chinese and several other languages will be available on the home market in May, its designer, the Beijing Stone Co., announced today. It is produced in Japan, with the software provided by Stone and hardware by Mitsui Bussam Co. Ltd. of Japan. According to an agreement signed last October, Stone will get all the profits from sales by itself in China including Hongkong, while Mitsui Bussam is responsible for sales abroad, leaving three percent of the profits to Stone. The word processor, technically known as "Stone MS-2400", can type block and italic Roman letters, eight types of Chinese characters, and the Russian, Greek and Japanese alphabets. Orders are now being accepted in Beijing, according to Stone. [Text] [Beijing XINHUA in English 1218 GMT 22 Apr 86 OW] /6091

TRADITIONAL MEDICINE MODERNIZATION--Beijing, May 6 (XINHUA)--Scientists here have developed a new process for sterilizing traditional Chinese medicines, including herbs, animal products and minerals, according to a local health official. The process involves a high-energy electron team, which disinfects the medicines without damaging their effective elements or producing a toxic residue. The Beijing Science and Technology Commission began research on the new process in 1983, and an official medical appraisal board has now approved it. The method is superior to chemical and high-temperative sterilization methods, said the official. [Text] [Beijing XINHUA in English 1434 GMT 6 May 86 OW] /6091

ELECTRONICS MINISTRY DECENTRALIZES AUTHORITY--Nanjing, May 8 (XINHUA)--The Ministry of Electronics Industry has put all its 172 enterprises under local administrative control, Vice-Minister Liu Jianfeng has said. From now on, Liu said, the ministry will concentrate on promoting cooperation between enterprises in different regions, instead of issuing mandatory production and other quotas as in the past. These enterprises will operate as relatively independent economic organizations, responsible for their own losses and profits, he said. The move taken by the Ministry of Electronics Industry is part of a general trend to do away with the old practice of organizing production according to administrative and departmental divisions. Owing to an unclear distinction between the functions of the government and enterprises, and barriers between different departments or regions, Liu said, too much centralization does not suit the national economic development and the challenge of the new technical revolution. [Text] [Beijing XINHUA in English 0538 GMT 8 May 86 OW] /6091

ADVANCED COMPUTER DISPLAY SYSTEM PASSES APPRAISAL--Beijing, May 22 (XINHUA)--An advanced Chinese-made computer display and processing system has passed state evaluation here. The development of this achievement by China's computer industry follows a large-scale computer with a capacity of 100 million operations per second in 1983, scientists said. The new system is the largest of its kind in China. It functions better than products of same kind now imported to China. The system, developed by the University of National Defense Science and Technology in Changsha, other research units, and factories throughout China, displays a detailed color picture and is used for remote sensing and telemetering pictures of meteorology and geology. [Text [Beijing XINHUA in English 0806 GMT 22 May 86 OW] /6091

SCIENCE, TECHNOLOGY COMMISSION PREPARES WHITE PAPER--China's first white paper on science and technology policies will be issued by the State Science and Technology Commission in August, CHINA DAILY learned yesterday. An official of the policy-making bureau of the State Science and Technology Commission said that this will be the first time for China to describe its policies on science and technology in a white paper, rather than in a "red-headlined" document intended only for the eyes of certain ranks of officials. "The purpose is to make the policies available to everybody," the official said. The paper also will include data gathered during China's first national survey of the scientific and technological situation. It will outline policy in 12 fields--energy, transport, communications, agriculture, consumer goods, machinery, materials, construction materials, urban construction, township construction, urban and rural housing, and environmental protection. [By Yang Xiaoping] [Text] [Beijing CHINA DAILY in English 26 May 86 p 1 HK] /6091

GANSU ECONOMIC, TECHNOLOGY MARKET OPENS--Gansu's economic and technology market was officially opened recently. Organized jointly by the Gansu Provincial Economic Committee and the Gansu General Federation of Trade Unions, the market is operated under the guidance of the State Economic Commission's Economic and Technology Market and the Gansu Technology Market Coordination and Guidance Group. The purpose of the Gansu Economic and Technology Market is to promote coordination between science and technology and the economy, thereby enhancing economic growth and prosperity. This market stresses the organization of the buyers' market based on the economic system and a greater increase in the awareness of "reliance" among industrial and mining enterprises upon science and technology. Since its inception, the Gansu Economic and Technology Market has held over 200 exhibits, including exhibits on initial results of technology transfers, technical needs, and technical services. [Text] [Article by correspondent Zhao Jianqi [6392 0256 0796]] [Tianjin JISHU SHICHANG BAO [TECHNOLOGY MARKET WEEKLY] in Chinese 18 Mar 86 p 1] 12949/7358

PHYSICAL SCIENCES

HYDROLOGIC FEATURES IN CYCLONIC EDDY REGION OF NORTHERN EAST CHINA SEA IN COLD SEASONS

Beijing HAIYANG KEXUE [MARINE SCIENCES] in Chinese Vol 9 No 5, 9 Sep 85 pp 1-4

[Article by Ding Zongxin [0002 1350 0207] of the Institute of Oceanography, Chinese Academy of Sciences: "Hydrologic Features in the Cyclonic Eddy Region of the Northern East China Sea in Cold Seasons"]

[Text] With regard to the hydrologic structure in the cyclonic Eddy region of the northern East China Sea in warm seasons and its month by month variation, the author had done a relatively systematic analysis. This paper is a continuation of the earlier work. In view of the fact that the vertical distributions of important factors such as temperature and salinity are uniform in the cold season, its structure is very simple. Most of the dominant hydrologic effects in the warm season do not appear. Hence, the method of description and the content of this paper are different from those in the earlier paper[1].

To date, the hydrologic feature and seawater pattern of the area of interest in the cold season were only analyzed by Mao Hanli [3029 3352 4409][2] in 1964. However, the pattern of variation of the hydrologic feature in the region of interest in the cold season has not yet been reported. Historic data showed that the month by month change in the hydrologic feature in the region is apparent. To understand the pattern of hydrologic feature variation in the region is significant in the investigation of the circulation structure in northern East China Sea.

A detailed analysis was made based on the data collected from October 1979 to April 1980.

It should be pointed out that from October to April (including late fall, winter, and early spring), with the exception of deep water region in October-December, the vertical distributions of temperature and salinity in the region are in a uniform or near uniform winter pattern. In this paper, this period is called the cold season.

---

*Survey Research Report 1224 of the Institute of Oceanography, Chinese Academy of Sciences.

I. Planar Distribution of Temperature and Salinity

In the cold season, due to continuous sinking of the surface layer and the wind mixing effect, the vertical distributions of temperature and salinity are uniform, with the exception of deep water region in October-December. Therefore, the discussion is limited to the planar distributions of temperature and salinity in the bottom layer (see Figure 1).

Figure 1 shows the planar temperature and salinity distribution on the bottom during the period October 1979-April 1980. It is not difficult to see several major features: (1) the distribution of isotherms is basically in agreement with that of the iso-salinity line. (2) In October, there is a nearly enclosed high temperature region in the middle of the area of interest.

The temperature gradient surrounding this high temperature region is very high, forming an obvious temperature front. (3) A low temperature, low salinity tongue extends from northwest toward southeast into the area of interest in the cold season. From January to April, this low temperature, low salinity tongue controls the entire area. The temperature and salinity of this tongue are very similar to those in the continental shelf of the southern Huanghai Sea. Hence, it might have been the continental shelf water brought over by the coastal current from the south Huanghai Sea. The high temperature, high salinity East Sea surface water is distributed outside this tongue, forming an apparent temperature front and a weak salinity front. (4) In March, a low salinity region wiht less than 3.3 precent was found at the tip of the low temperature, low salinity tongue. Its temperature was also slightly lower than the surrounding water temperature. Based on an analysis of historic data, this low salinity region usually exists in March-April.

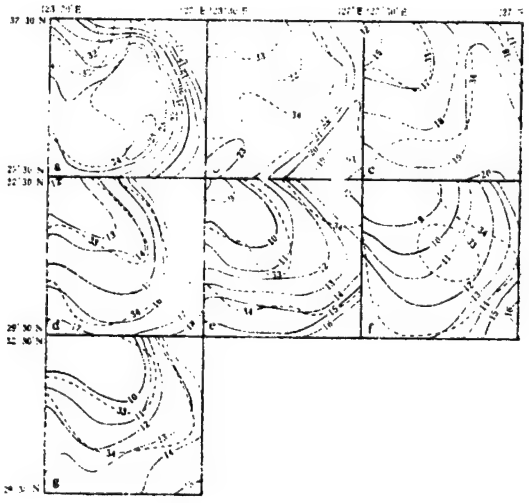

Figure 1. Planar Distribution of Temperature and Salinity

(a-g represent October through April)

-·- temperature (°C) -- salinity (°/oo

Comparing the variation of the low temperature, low salinity tongue throughout the cold season we can see that the tip of the tongue begins to extend into the northwest corner of the area of interest in October. Because the temperature of the water in the continental shelf of southern Huanghai Sea is higher near the coast, its salinity is higher away from the coast. Consequently, the low salinity tongue is not the same as the low temperature tongue. From the iso-salinity line, due to the presence of the high temperature, high salinity region in the center of the area of interest, this low temperature, low salinity tongue has a tendency to move southward along the west edge. In November, this tongue begins to turn toward the southeast and extends into the center of the area under investigation. Correspondingly, the high temperature region shrinks significantly. It gradually extends in the southeast direction in the months to follow. By February, it almost occupies most of the area under study. At this time, the high temperature, high salinity surface layer of the East China Sea retreats to the southeast and northeast corners of the region. In March-April, this tongue retreats slightly back toward the northwest. Due to the movement of this tongue, the temperature front and salinity front also vary. The more the tongue extends eastward, the more the temperature front and salinity front located in the northeast section of the region move westward. The more the tongue moves southward, the more the temperature front and salinity front located in the west section move northward and vice versa.

II. Sectional Distribution of Temperature and Salinity

In the winter season, the cross-sectional temperature distribution and salinity distribution and the trend of variation are similar at 30°N, 31°N and 32°N. In this paper, the cross-section at 32°N is used as an example to analyze the special features and variation pattern of temperature and salinity.

Figure 2 shows the temperature and salinity distributions at 32°N between October 1979 and April 1980.

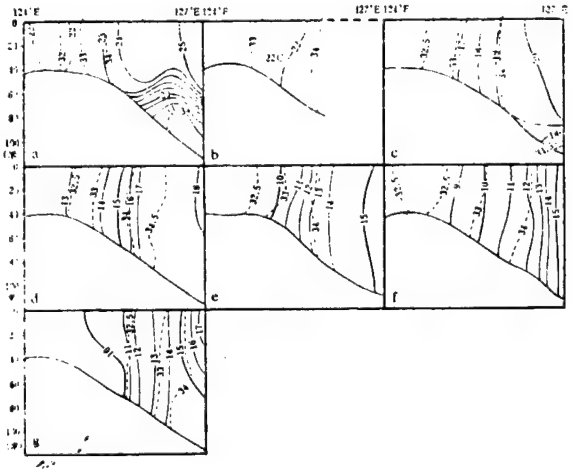

Figure 2. Cross-sectional Distribution of Temperature and Salinity

(a-g represent October through April, respectively)

—— Temperature (°C) --salinity (°/oo)

Based on Figure 2, with the exception that there is an apparent layer in the deep water region in October, i.e. a relatively strong temperature varying layer exists below the 50 meter level, the vertical distribution of temperature and that of salinity are uniform or near uniform. Both temperature and salinity increase from west to east. In the center of the low temperature, low salinity region, however, both temperature and salinity are slightly lower than those on either side. On the west side of the cross-section, salinity is always below 3.3 percent. In addition, the temperature is also the lowest in the entire cross-section. On the east side, salinity is always higher than 3.4 percent. It can be as high as 3.45 percent. The seawater temperature is also higher. It is an area controlled by the high temperature, high salinity surface layer of the East China Sea. The region where salinity is between 3.3-3.4 percent is a region in which the continental shelf water mixes with the surface water of the East China Sea. The horizontal temperature and salinity is lowest in October, slightly less than 3.2 percent. Maximum salinity occurs in January, higher than 3.45 percent. Maximum temperature occurs in October, approximately 25°C. The minimum occurs in March, approximately below 9°C. This minimum occurs 1 month behind that in the coastal area or other region. This may be attributed to the effect of the cold coastal current of the Huanghai Sea.

By comparing the patterns shown in Figure 2, it is obvious that the vertical temperature and salinity structures do vary. First, from the thickness of the uniform layer, it gradually increases from October through January. From 40 meters in October, it gradually grows to nearly 100 meters. By this time, temperature and salinity are uniformly distributed vertically across this section. In April, the isotherms in the shallow water begin to tilt. The upper layer is de-laminated. In October, there is an apparent temperature varying layer located at between 40-75 m in the deep water region. The vertical gradient is approximately 0.2°C/m. There is also a salinity gap layer. The vertical gradient is approximately .001 percent. This temperature varying layer gradually deepens by the month and the gradient becomes smaller. By January, it completely disappears. The front between the low temperature, low salinity tongue and the high temperature, high salinity surface water of the East China Sea moves according to the following: In October the mean center position is near 125°E. It moves slowly toward the east. By March, it reaches 126°30'. It begins to move back westward in April. The movement of the front in the cold season is consistent with the changes of these two systems.

III. Types of Vertical Distribution of Temperature and Salinity

In the area under study, the vertical temperature and salinity distributions in the cold season are primarily determined by the intensity of the vertical convection of seawater and the effect of warm current. In October-December, the temperature is not low enough for vertical convection current to reach the ocean floor in deep water area with depth greater than 50 m. In addition, due to the effect of the Huanghai Sea warm current, there are layers in the deep water area. The vertical temperature distribution has a negative gradient with temperature varying layers. The vertical salinity distribution has a positive gradient with salinity varying layers. Starting from January, both temperature and salinity distributions are uniform vertically. In conclusion,

the temperature and salinity distributions are relatively simple in the cold season. This is the primary distribution pattern in the cold season which spreads out wide and lasts over a long period of time.

Microscopically, there are two counter-structures in the vertical salinity distribution; high salinity middle layer and low salinity middle layer located in the west and east of the area under investigation, respectively. These two counter-structures are created by the diffusion of seawater along iso-σ_t surfaces.

IV. Discussion

1. Variation of the Hydrographic System

Based on Figure 1, only continental shelf water of the Huanghai and high temperature, high salinity surface water of the East China Sea exist in the area in the cold season. The variation of these two systems is mutually interacting. In order to compare to the variation of the hydrographic system in the warm season, the 3.4 percent iso-salinity line is still chosen as the border between the high temperature, high salinity surface water of the East China Sea and the continental shelf water of the Huanghai Sea. It was reported in reference [3] that the salinity at the boundary of the surface water of the East China Sea is less than 3.4 percent in the warm season, approximately 3.35 percent, and is above 3.4 percent in the cold season. Hence, if the 3.4 percent iso-salinity line is used to divide the East China Sea surface water, then the region thus defined is slightly undersized in the cold season and oversized in the warm season. Because the boundary of these two water systems is not rigorously defined in this paper, it is still feasible to use 3.4 percent salinity line to analyze the growth and decline of the surface water of the East China Sea.

Based on Figures 3a and 3b, the position of the 3.4 percent iso-salinity line in the surface layer is identical to that in the bottom layer, which indicates that the entire water body moves into the area from top to bottom. This is different from the penetration from the deep bottom in the warm season. In October, the East China Sea surface water almost occupies the entire area under study. From November to February, the surface water of the East China Sea retreats toward the east and south as the low temperature, low salinity tongue extends into the area. By February, it almost totally retreats out of the area. Between February and April, this water system has a tendency to move northward and westward. Based on these facts, the surface water of the East China Sea seems to exhibit a complete growth and decline cycle in the cold season.

In view of the monthly change of the 3.4 percent iso-salinity line in the bottom layer in the warm season (see Figure 3c), it is not difficult to see that the East China Sea surface water varies approximately according to the following. Beginning in July, surface water of the East China Sea penetrates from the bottom in the southern part of the region. In August and September, its penetration region grows by the month. In addition, its thickness also increases. By October, it reaches the surface. By that time, it covers most

of the area under study. This is the most dominant season for this system. From November through February, because the southward coastal current of the Huanghai Sea becomes stronger, the surface water retreats correspondingly to the south and east. Between March and May, this high temperature, high salinity begins to push into the area again. Afterward, it retreats correspondingly to the south and east. Between March and May, this high temperature, high salinity begins to push into the area again. Afterward, it retreats back to the south and east again in May and June. It seems that the surface water of the East China Sea undergoes two cycles, i.e. July to February and March to June. During the first cycle, July through October is the growing season and November through February is the weakening season. In the second cycle, March through May is the developing period and May through June is the weakening season. In this cycle, the changes are not very large. It is a secondary cycle. Obviously, this variation is directly related to the intensity of the black tide and the coastal current along the Huanghai Sea.

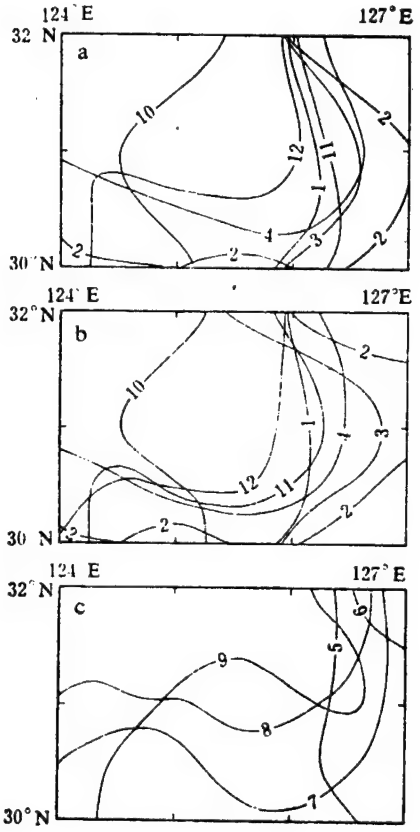

Figure 3. Monthly Variation of 3.4 percent Iso-salinity Line in Cold and Warm Seasons.

The variation of the continental shelf mixed water of the Huanghai Sea (which is called the cold water of the Huanghai Sea at the bottom in the warm season) is opposite to that of the surface water of the East China Sea.

2. Causes for the Formation of High Temperature and Low Salinity Regions

Based on Figure 1a, there is a nearly enclosed high temperature region on the bottom. This high temperature region exists almost every October. Based on historic data, this high temperature region is formed primarily because the water is relatively shallow in this area. The surface water of the East China Sea occupies this area. The low temperature, low salinity tongue extends into this area from the north. The water in the east, west and south is much deeper and the temperature is also colder. Thus, a high temperature region is created at the bottom. As the low temperature, low salinity tongue expands, this high temperature area also shrinks until it disappears totally.

Based on Figure 1f, there is a low salinity (sometimes low temperature as well) region in front of the tongue. Historic data show that this low salinity region often exists in March and April. Occasionally, it also exists in February. In this case, it is the low salinity center from top to bottom. In past studies, this low salinity region never attracted any attention. The author believes that this low salinity region signifies a change in the circulation of the Huanghai Sea and East China Sea. Specifically, the coastal current of the Huganhai Sea may not enter the area of interest at this time. Instead, it moves eastward towards the area northeast of the mouth of the Changjiang River. This viewpoint can be derived from the following analysis.

In order to analyze the cause of the low salinity region, we plotted the distribution of anomalous temperature and salinity of the bottom ($T=T_{March}-T_{February}$, $S=S_{March}-S_{February}$) (see Figure 4).

Based on Figure 4a, in the vast area between 31°-33°N and west of 125°E, i.e. west of the low temperature, low salinity tongue which is located at the northwest corner of the area of interest, the anomaly of salinity is positive. The maximum anomaly is .25 percent. The salinity anomaly curve extends eastward in the shape of a tongue centered at 32°N. This indicates that the salinity in this area is higher in March than in February. The author believes that this positive salinity anomaly region is a result primarily due to the intensifying of the high salinity warm current from Taiwan toward the north. In the narrow band north of 33°N, both temperature and salinity anomalies are negative. The maximum temperature anomaly is -3.4°C and the maximum salinity anomaly is -.08 percent. They appear in the eastern part of the anomalous region. The distribution of anomalies described above may be caused by the change of direction of the north bound Taiwan warm current and south bound Huanghai Sea coastal current towards the east or northeast after they meet, pushing the low temperature, low salinity tongue near 33°N, 124°E into the Huanghai Sea warm current area.

It is clear based on Figure 4b that the low oxygen tongue west of the area under study which represents the warm Taiwan current has already extended northward to 32°30' in March. It moved nearly 50 nautical miles as compared to that in February. It meets the high oxygen tongue from the coastal current of the Huanghai Sea at 32°30'. Both show the tendency to go east or northeast. At this time, they merge and flow toward the northeast and cuts off (or nearly so) the low temperature, low salinity tongue and the warm current of the Huanghai Sea. Because a high oxygen band is formed along the coastal current of the Huanghai Sea (corresponding to high salinity) and a low oxygen tongue

(in the Huanghai Sea warm current region) appear to the north and south of this band, respectively. In addition, a low salinity area is formed in the middle of the region of interest. The formation of this low salinity region is principally determined by the strength of the Taiwan warm current.

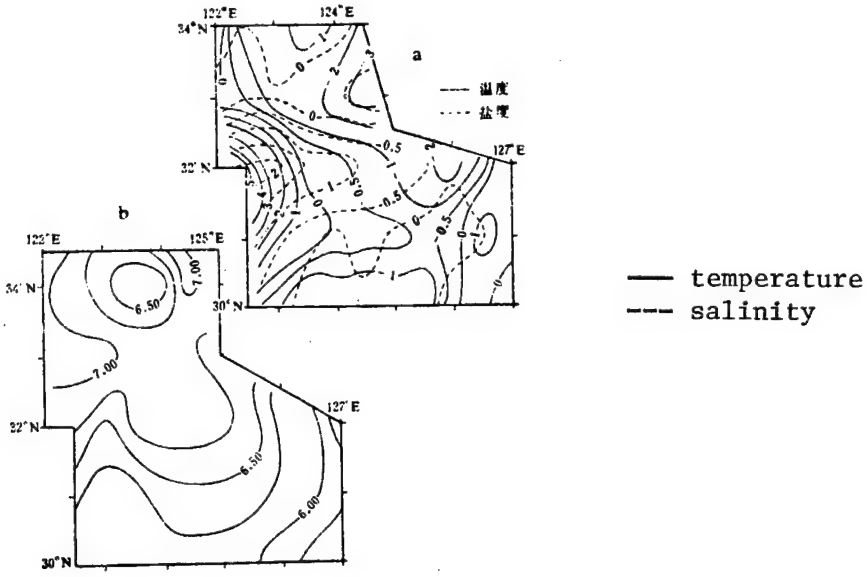

Figure 4 (a) Distribution of Temperature and Salinity Anomalies at the Bottom, and (b) Distribution of Dissolved Oxygen in the 10 Meter Layer.

In summary, the appearance of the low salinity region signifies that Huanghai Sea coastal current no longer enters the northern part of the East China Sea, thus creating an enclosed counterclockwise loop in the southern part of the Huanghai Sea. The region covered by the counterclockwise loop, which originally extends into the East China Sea, is drastically reduced. This low salinity region is an important piece of evidence in studying the variation of the curculation in the Huanghai Sea and East China Sea.

REFERENCES

[1] Ding Zongxin, 1985, "Hydrologic Structure of the Cyclonic Eddy Region of the Northern East China Sea in the Warm Season," HAIYANG YU HUZHAO [OCEANS AND LAKES] 16 (2): 138-146.

[2] Mao Hanli [3029 3353 4409], Ren Yunwu [0117 0336 29762, and Sun Guodong [1327 0948 2767], 1964, "The Hydrologic Features and Water Systems of the Southern Huanghai Sea and Northern East China Sea (28°-37°N) in the Cold Season," HAIYANG KEXUE JIKAN [SYMPOSIUM OF OCEANOGRAPHY] 01; 78-125.

[3] Su Yusong [5685 5148 1529], 1980, "Method of Using Temperature and Salinity Points To Divide Water Boundaries and Analysis of Water System in the Western East China Sea," HAIYANG XUEBAO [JOURNAL OF OCEANOGRAPHY]] (1): 1-13.

12553/12232
CSO: 4008/1042

APPLIED SCIENCES

CALCULATION OF DETECTION RANGE OF LOW-LIGHT NIGHT VISION DEVICES

Shanghai HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH] in Chinese
Vol 4 No 4, Aug 85 pp 283-288

[Article by Wu Baoye [0702 1405 2814], Kunming Institute of Physics]

[Text] ABSTRACT. A new method of calculating the detection range of low-light night vision devices is described from an applications viewpoint. Calculation formulas are presented and used in a specific example. The method can be used in the overall design and performance evaluation of night vision devices.

I. Introduction

The detection range of a low-light night vision system is an extremely important aggregate characteristic. The factors affecting it are numerous and complex and involve the state of the object observed, atmospheric conditions, sky brightness, the characteristics of the image intensifier and other components of the device, and the visual characteristics of the human eye. Below we present a new applications-oriented calculation method. The meanings of certain basic characteristics and the methods of calculating them are described as the discussion requires, the computation formulas for determining the detection range are summarized, and a sample calculation is demonstrated.

II. Target Brightness, Background Brightness and Noise Brightness

Let the intrinsic brightnesses of the target and the background be L_{t0} and L_{b0}, with $L_{t0} > L_{b0}$ (for cases in which $L_{b0} > L_{t0}$, the calculation is performed by treating L_{b0} as the target brightness and L_{t0} as the background brightness), and let the brightness of the sky be L_q, the atmospheric transmissivity over a 1-km path be τ_a, and the target brightness visible to the naked eye at a distance R be L_{tR} [1]. Then

$$L_{tR}=\tau_a^R L_{to}+L_q(1-\tau_a^R)=\tau_a^R(L_{to}+L_d), \qquad (1)$$

where

$$L_d = L_q(1-\tau_a^R)/\tau_a^R = E_q(1-\tau_a^R)/(\pi\tau_a^R). \quad (2)$$

Here E_q is the detectable sky brightness (in lux [lx]), $L_q(1 - \tau_a^R)$ is the "atmospheric radiation brightness" in a path length R (generally called the exernal noise), and L_d is the brightness at the target location equivalent to the external noise. In addition, the night vision device's image intensifier has internal noise produced by thermal radiation and the like. If the image intensifier's equivalent background brightness is E_h (lx), the relative aperture of the objective is D/f_{ob}, its transmissivity is τ_{ob} and the brightness at the target that would be equivalent to the internal noise is L_h (in nits [nt]), we have

$$L_h = 4E_h \Big/ \left(\pi\left(\frac{D}{f_{ob}}\right)^2 \tau_a^R \tau_{ob}\right). \quad (3)$$

Let L_{dh} be the noise brightness; then

$$L_{dh} = L_d + L_h(\text{nit}). \quad (4)$$

Including L_{dh} in the derivation, we obtain:

$$\left.\begin{aligned} &\text{effective target brightness} \quad L'_{to} = L_{to} + L_{dh}(\text{nit}), \\ &\text{effective background brightness} \quad L'_{bo} = L_{bo} + L_{dh}(\text{nit}). \end{aligned}\right\} \quad (5)$$

Thus the relative illuminance at the photocathode is

$$\left.\begin{aligned} E_t &= \frac{\pi}{4}\left(\frac{D}{f_{ob}}\right)^2 \tau_a^R \tau_{ob} L'_{to} \quad (\text{lux}), \\ E_b &= \frac{\pi}{4}\left(\frac{D}{f_{ob}}\right)^2 \tau_a^R \tau_{ob} L'_{bo} \quad (\text{lux}). \end{aligned}\right\} \quad (6)$$

III. Target Spatial Frequency and Information Coefficient

The spatial frequency of the target is the number of cycles (also called the number of line pairs [lp]) per unit length of the target, in units of lp/mm, denoted R_f. R_f expresses the clarity with which target details are distinguished. Any observed target can be simplified as a planar figure, and this planar figure can be divided up, in terms of the requirements for observation of detail, into m regions. If the total area of the figure is S and the areas of the individual regions are $S_1, S_2, \ldots, S_m$, then, obviously, $S_t = \sum_{i=1}^{m} S_{i\circ}$. If the spatial periods corresponding to the observation requirements for the regions are $N_1, N_2, \ldots, N_m$, then the target spatial frequency will be

$$R_f = \frac{1}{l}\left(N_1\frac{S_1}{S_t} + N_2\frac{S_2}{S_t} + \cdots + N_m\frac{S_m}{S_t}\right) = \frac{1}{lS_t}\sum_{i=1}^{m} N_i S_i, \quad (7)$$

where n is the length of some side (m) of the planar figure of the target; and N is the number of line pairs for the i-th region (the choice of its value depends on observation requirements, and may be taken from Table 1).

Another point meriting attention is that the target spatial frequency embodies only the extent to which the target is distinguished, but does not express the

information content of the target. For example, two targets may have the same spatial frequency but be quite different in size, so that they have different information contents; the difference in information content is reflected in each image element (or line). In order to express the information content of the target, we define the information coefficient y as the ratio of the equivalent height to the line width:

$$y=\left(\frac{S_t}{l}\right)\Big/\left(\frac{1}{2R_f}\right)=\frac{2}{l}R_fS_t=\frac{2}{l^2}\sum_{i=1}^{m}N_iS_{io} \qquad (8)$$

Table 1. Spatial frequency

Observation requirement / Method	Detect object	Identify object	See object clearly
J. Johnson	1	4	8
West German national defense technology annual	2~4	6~8	10~12

IV. Target Image Contrast

This contrast involves not only energy, but even more importantly, the energy distribution. The optimum system should not alter the energy distribution of the target image, but in reality this is unattainable for various reasons.

Let the intrinsic contrast of the image be $C_0=(L_{to}-L_{bo})/(L_{to}+L_{bo})$; then, as a result of the noise brightness L_{dh}, the energy distribution of the target image on the photocathode will be degraded and the resultant contrast will be the product of C_0 by C_p, where C_p is the noise contrast transmission factor,

$$C_p=\left(1+\frac{2L_{dh}}{L_{to}+L_{bo}}\right)^{-1}. \qquad (9)$$

The image transmitted by the image intensifier is displayed on a fluorescent screen, where its contrast is further degraded by energy synergy and cross-leakage between image elements; the higher the transmitted spatial frequency, the more pronounced the synergy and cross-leakage. The contrast transmission factor of the image intensifier can be expressed [2] as

$$C_i=\frac{8}{\pi^2}\left[M(f)+\frac{1}{3^2}M(3f)+\frac{1}{5^2}M(5f)+\cdots\right]\doteq\frac{8}{\pi^2}M(f), \qquad (10)$$

where f is the spatial frequency of the image (lp/mm); M(f) is the modulation transfer function of the image intensifier at a spatial frequency f, which can be approximated as

$$M(f)\doteq\exp\left[-\left(\frac{R\cdot R_f}{f_c\cdot f_{ob}}\sqrt{\frac{\pi\eta''}{2y}}\right)^n\right], \qquad (11)$$

where f_c is the spatial frequency constant (the frequency value when M(f) = e^{-1}); n is the device exponent, generally with a value between 1.1 and 2.1; f_{ob} is the focal length of the objective (mm); and η" is a factor allowing for the effect of the target's shape on viewing characteristics, which is determined experimentally.

Thus the contrast of the image that appears on the image intensifer screen is

$$C=C_0\cdot C_p\cdot C_{to} \qquad (12)$$

If the ocular has only transmission losses, the target image observed on the screen by the eye will then also have a contrast C.

V. Equivalent Resolution of the Image Intensifier

The resolution is an important characteristic of the image intensifier. In a high-brightness operating environment, image intensifier performance is limited primarily by M(f), and under these conditions the intensifier tube's maximum resolution is equivalent to the spatial resolution at about the 3 percent level on the M(f) curve for the tube. In a low-brightness environment (the conditions under which night vision devices chiefly operate), image intensifier performance is limited primarily by quantum noise, and the quantum noise of the image intensifier results chiefly fron photoelectron fluctuations at the photocathode [3,4]. We can then derive the equivalent resolution of the image intensifier in a low-brightness environment, which for brevity we will call the low-brightness equivalent resolution, denoted δ_c:

$$\delta_c=\frac{kC}{(f/n_0)N_f}\sqrt{\frac{K_m\tau_a^K\tau_{ob}StL'_{to}}{1+C}}(\text{lp/mm}), \qquad (13)$$

where (f/n0) and τ_{ob} are the F number of the objective and the transmissivity; S is the integral sensitivity of the photocathode (μA/lm); N_f is the noise coefficient of the image intensifier, whose square is generally called the image intensifer noise factor. The value of N_f for the present generation of single-stage intensifier tubes is about 1.2, that for three-stage series tubes is 1.5, and that for second-generation tubes is generally about 2 [8]; k is a constant that is determined from the height-to-width ratio of the lines on the resolution boards used for laboratory measurements and the corresponding threshold signal-to-noise ratio K; Csorba [6,7] reports that with a height-to-width ratio of 5:1 and with K = 3.1, the calculated value is k = 283.25866 ≐ 283. K_m is the spectral matching factor,

$K_m=\int_{\lambda_1}^{\lambda_2} r_\lambda S_\lambda d\lambda \Big/ \int_{\lambda_1}^{\lambda_2} r_\lambda d\lambda$, where r_λ is the relative radiative power of the sky spectrum, and S_λ is the relative spectral sensitivity of the photocathode. Typical values of K_m are shown in Table 2.

Table 2. Typical calculated values of K_m

Photocathode / Brightness	S_{1}	S_{20R}	S_{25}
Full moon	0.86	0.9	0.94
Clear sky, starlight	0.81	0.87	0.92

The quantity t is the integration period of the human eye, which is 0.2 seconds at low brightness. The other variables (C, τ_d^R, L') are as described above.

Let δ_ℓ be the maximum resolution of the image intensifier. Then, at any brightness and any contrast, the overall effective resolution δ_W of the image intensifier is approximately

$$\delta_w \doteq \delta_c \cdot \delta_l / \sqrt{\delta_c^2 + \delta_l^2}; \qquad (14)$$

Obviously, at low brightness, δ_C is very large, and δ_ℓ^2 can be ignored in the denominator, so that $\delta_W \doteq \delta_\ell$; conversely, at low brightness, δ_C will be small and we will have $\delta_W \doteq \delta_C$.

VI. Visual Characteristics of the Eye

The human eye can see objects because the sensitive elements of the retina receive optical radiation from them and transmit it to the optic nerve. Many earlier investigations and measurements established in macroscopic terms that when objects are observed with the naked eye, the visual characteristics of the eye are strongly dependent on the brightness of the observed object, its contrast, and the angle it subtends. When the eye observes the object image on the fluorescent screen of the night vision device through the eyepiece, the visual characteristic is clearly similar to that in naked-eye observation. The required sight angle α_n (in minutes) for observation of a fluorescent screen through the ocular is approximately related to the equivalent mean brightness B (nt) of the image on the screen and the contrast C by the equation

$$\alpha_n = \frac{0.17C^{0.2} + 0.0002(\tau_e B)^{-\frac{1}{2}} + 0.028(\tau_e B)^{\frac{1}{1.7}}}{C\sqrt{\tau_e B}} + \alpha_{\min}, \qquad (15)$$

where α_{min} is the minimum resolution angle for observation of the fluorescent screen through the objective with optimum brightness and contrast,

$$\alpha_{\min} = [(3438M/f_e\delta_l)^{1.25} + 1]^{\frac{1}{1.25}}. \qquad [16]$$

where τ_e and f_e are the transmissivity of the objective and the focal length (mm), and M is the linear gain of the image intensifier's electrooptical system.

It must be borne in mind that B is the effective mean brightness of the image, and for an image intensifier without automatic brightness control it is equal to

$$B = GE_0/(\pi N_f^2) \quad \text{(nit)}, \qquad (17)$$

where $E_0 = \frac{1}{2}(E_t + E_b)$ (E_t and E_b are calculated from equation (16) and G is the brightness gain (asb/lx). For image intensifiers with automatic brightness control (ABC), B is chosen by a three-step process: (1) E_0 is calculated from equation (6) and the value of B corresponding to E_0 is found on the B-E_0 curve for the image intensifier being used; (2) if the value of B that is found is in the inclined section of the B-E_0 curve (where the

brightness is not controlled), the value of B calculated from equation (17) is the equivalent image brightness; (3) if the value of B is in the level section of the B-E_0 curve (where the brightness is controlled), this value of B is compared with that obtained from equation (17) and the smaller value is used.

When τ_e and a_{min} are both equal to 1, equation (15) relates the three main vision factors affecting viewing of the target.

VII. Equations for the Detection Range of a Low-Light Night Vision Device

When a night vision device is used to observe a target, in reality the information from the target is transmitted to the eye via the objective, the image intensifier tube and the ocular. It must be borne in mind that during this process the target image that appears on the screen is a real image in two dimensions, and the system's detection range R must satisfy the inequality

$$\frac{y}{2R^2R_f^2}\geqslant\frac{\pi\eta''}{4f_{ob}^2\delta_w^2}\geqslant\frac{\pi\eta''}{4\Gamma^2}\left(\frac{\eta''\alpha_n}{3488}\right)^2, \tag{18}$$

where Γ is the angular magnification of the device, $\Gamma=f_{ob}M/f_e$, and η' is a factor that is included to alleviate observer fatigue during continuous visual observation; it generally has a value of 2 to 3. When finding R from equation (18), for convenience expressions 1 and 2 and 1 and 3 can be successively solved together, giving detection ranges R_1 and R_2; the device detection range is the smaller of these two values. The specific procedure is:

$$R_1\leqslant\frac{f_{ob}\delta_w}{R_f}\sqrt{\frac{2y}{\pi\eta''}}=\frac{f_{ob}\delta_c\delta_l}{R_f}\sqrt{\frac{2y}{(\delta_c^2+\delta_l^2)\pi\eta''}}, \tag{19a}$$

$$R_2\leqslant\frac{3438\Gamma}{R_f\eta'\alpha_n}\sqrt{\frac{2y}{\pi\eta''}}, \tag{19b}$$

$$R=\min(R_1, R_2). \tag{19c}$$

Equations (19) are the formulas for calculating the detection range of a low-light night vision device. R is the detection range, and the other parameters in the formulas are calculated from equations given earlier.

If in the calculation results R_1 R_2, this means that owing to limitations on visual characteristics the detection range of the device is only $R = R_2$, and the range can be improved by increasing the magnification of the objective or the brightness gain of the intensifier tube. Conversely, if R_1 R_2, quantum noise is the limiting factor and the detection range is $R = R_1$; in this case performance can be improved by increasing the aperture of the objective, increasing the photocathode sensitivity of the image intensifier, or decreasing the noise factor. When $R \doteq R_1 \doteq R_2$, the maximum

night vision capability of the device is realized, and in general terms the optimum characteristics have been achieved.

When solving equations (19a) and (19b), because R_1 and R_2 are both implicit functions, only an optimal-search successive approximation method can be used to solve them, requiring that the difference between successive results be less than a specified value ϵ. For example, when solving equation (19a), the known parameters are first determined for the night vision device being used and the other conditions, then an arbitrarily chosen detection range R_1' is substituted into the right side of equation (19a), giving the result R_1'', after which a test is made for $|R_1''-R_1'|<\varepsilon$ (as a rule, ϵ = 0.2-0.5 m); if this condition is met, then $R_1 = R_1'$. Otherwise the value of $(R_1''-R_1')\times 0.618+R_1'$ is calculated and substituted into the right side of equation (19a) in place of the original value of R_1'; this procedure is repeated until the result meets the condition stated above. A similar method is used to calculate R_2 in equation (19b), after which equation (19c) is used to determine the system's detection range R.

This computation method has been programmed on a TI-59 calculator.

VIII. Computation Example

Suppose that we use a night vision device to observe a standing person wearing blue work clothes. The observation field is an open area with a mud wall covered with grass and with a few trees behind the target. The sky is clear, with no moon but with stars and some cloud, and during observation the detectable lateral illumination of the target changes from 3.6×10^{-3} to 1.5×10^{-3} lx.

Characteristics of the Night Vision Device

(1) Optical system: focal length of objective f_{ob} = 90 mm, transmissivity τ_{ob} = 0.8, relative aperture D/f_{ob} = 1/1, focal length of ocular f_e = 12.57 mm, transmissivity τ_e = 0.75.

(2) Image intensifier tube: uses a reduced-gain first-generation single-stage tube with photocathode sensitivity s = 32 A/lm, maximum resolution δ_ℓ = 37 lp/mm, amplification M = 0.29, brightness gain G = 2716, effective background brightness $E_0 = 10^{-7}$ lx; from the measured modulation transfer function we can derive the spatial frequency f_c = 14.5 lp/mm and the device exponent n = 1.5. The noise factor N_f is chosen as 1.2.

Target Characteristics: height of person 1.7 m, width 0.5 m. If a spatial frequency N = 4 lp is required to identify the person, then

$$R_f = \frac{4}{1.7} = 2.353 \text{ lp/m}, \quad y = 2R_f\frac{S_t}{l} = 2\times\frac{4}{1.7}\times\frac{1.7\times 0.5}{1.7} = 2.353$$

(or $R_f = \frac{4}{0.5} = 8$ lp/m , y = 27.2 may be used). The reflectivity of the blue

work clothes is 0.2 and that of the grassy background is 0.55.

Atmospheric Conditions: Atmospheric transmissitivity per kilometer τ_α = 0.6, spectral matching coefficient K_m = 0.92.

Other Parameters: We choose η' = 3, η'' = 1.2, ϵ = 0.2 m. We calculate the angular magnification as Γ = 2.076, α_{min} = 2.7826', C_0 = 0.466667.

The calculation results are as follows (for three light intensities):

(1) for $E_q = 9 \cdot 10^{-4}$ lx, we obtain R_1 = 198 m, R_2 = 199 m, so that the device detection range is R = 198 m.

(2) for $E_q = 1.5 \cdot 10^{-3}$ lx, we obtain R_1 = 235 m, R_2 = 220 m, so that R = 220 m.

(3) for $E_q = 2.55 \cdot 10^{-3}$ lx, we obtain R_1 = 277 m, R_2 = 242 m, so that R = 242 m.

These calculation results are in essential agreement with measurements.

BIBLIOGRAPHY

1. Bailey, H. H., and Mundie, L. G. AD 685704, 1969.

2. Wang Shuyan [3769 6619 3508], translator. HONGWAI JISHU, Vol 5, No 5 (1983), p 8.

3. Csorba, L. P. RCA REVIEW, Vol 30, No 1 (1969), p 3.

4. Csorba, L. P. RCA REVIEW, Vol 32, No 2 (1979), p 297.

5. Csorba, L. P. APPLIED OPTICS, Vol 18, No 14 (1979), p 2440.

6. Cui Yulin [1508 3768 2651], translator. HONGWAI JISHU, Vol 5, No 3 (1983), p 16.

8480
CSO: 8111/1097

APPLIED SCIENCES

BRIEFS

NEW CHINESE-CHARACTER MINICOMPUTERS--Two new mini-computers received the seal of approval from 90 engineers and specialists yesterday in Beijing, advancing the level of domestically produced computers. The computers were designed and produced by Yanshan Research Centre for Computer Application. The new ZD-3100 picture and language computer and ZD-1000 portable computer, both with Chinese characters, are up to the technical level of IBM's PC/XT computer, an engineer said. The ZD-3100 computer is capable of printing 7,663 Chinese characters in 5 different styles and 682 words from other languages. Characters can be enlarged or reduced and printed in red or black. The computer is also programmed to draw and print graphics. Pictures can be changed and Chinese characters inserted on the screen, which should be a great aid to graphic designers, engineers and architects. The ZD-3100 also offers a palette of 512 colours, from which 16 can be used in any one picture. The ZD-1000 computer is designed for those working on the move, businessmen and journalists. When connected to an ordinary telephone line, the machine can tune into and exchange information with a similar computer at home. It operates on mains electricity as well as batteries. It has a vocabulary of 6,763 Chinese characters. The two machines have been developed entirely with Chinese technology. They will go into mass production as soon as possible after yesterday's appraisal. [By Xie Songxin] [Text] [Beijing CHINA DAILY in English 25 Jan 86 p 2 HK] /6091

NEW CRYSTAL MATERIAL DEVELOPED--Beijing, April 29 (XINHUA)--China has succeeded in developing a new kind of crystal which will be applied in the high precision laser range gauge of the third generation of satellite, according to a report by the "China Science and Technology Gazette." Called non-linear optical crystal of low-temperature phase bias barium borate, the material was developed by the Fujian Material Structure Research Institute of the Chinese Academy of Sciences, which claimed to lead the world in the study of such material. Now nearly 20 foreign firms and other units offered to cooperate with the institute in the further development of the material or asked for the supply of such material, the paper reported. [Text] [Beijing XINHUA in English 0139 GMT 29 Apr 86 OW] /6091

LARGEST INTEGRATED CIRCUIT DEVELOPED--Beijing, May 17 (XINHUA)--China has produced its largest integrated circuit, a 64-K dynamic stochastic memory early this year, today's PEOPLE'S DAILY reported. The circuit was made under the organization of a joint corporation of microelectronics in Wuxi, Jiangsu Province, the paper said. The circuit was tested on a production line before its formal production. As a result, workers and researchers grasped the techniques at the same time and the preparation period was shortened, it said. In October 1985, Qinghua University in Beijing produced a 16-K static random access memory. [Text] [Beijing XINHUA in English 0704 GMT 17 May 86 OW] /6091

LIFE SCIENCES

BRIEFS

MONGOLIAN MEDICINE FACTORY IN LIAONING--Shenyang, March 29 (XINHUA)--A pharmaceutical factory of traditional Mongolian medicine has been put into operation in Liaoning Province. The Mongolian medicine has a history of 1,400 years, and is said to be especially effective for treating common diseases among nomadic herdsmen, such as rheumatism and arthritis. The factory, in Fuxin Mongolian Autonomous County, produces 42 patent drugs, according to officials here. [Text] [Beijing XINHUA in English 1629 GMT 29 Mar 86 OW] /6091

BIOTECHNOLOGY MEDICINE HELPS CONTROL CANCER--Beijing, April 26 (XINHUA)--Chinese scientists have developed a new medicine through biotechnology to control cancer of the esophagus, according to the Institute of Biophysics in Beijing. The medicine, named "Weimeisu", contains 12 vitamins, 19 amino acids and multiple trace elements. It has proved effective in 96 percent of cases among 300 patients who were treated in clinical experiments over the past year. Cancer of the esophagus claims 150,000 lives each year in China. Generally, malignant tumors, with cancers of stomach, liver and esophagus as major killers, cause 800,000 deaths each year throughout the country, according to official statistics. Tang Pinzhi, an assistant research fellow at the Biophysics Institute, and his colleagues started to develop the drug in 1974. Over the past 12 years, they have investigated about 100,000 people in five provinces and treated patients with the new medicine. The scientists also discovered that "Weimeisu" is effective for atrophic and superficial gastritis. Atrophic gastritis often results in stomach cancer. China plans to introduce the new medicine at a technical fair to be held in Birmingham, Britain, in October. [Text] [Beijing XINHUA in English 0637 GMT 26 Apr 86 OW] /6091

BLOOD SUBSTITUTE SUCCESSFUL ON BATTLEFIELD--Beijing, May 19 (XINHUA)--A blood substitute developed by Chinese doctors has been successfully used for transfusions on the Laoshan battlefield in Yunnan Province, Sunday's edition of "Health News" reported. Medical experts were quoted by the newspaper as saying that this was the first time a blood substitute had been used in Chinese battlefield emergencies. The synthetic perfluoro-carbon blood substitute has similar oxygen-carrying and carbon dioxide-discharging capacities as natural blood, according to doctors from the Chinese Academy of Sciences. The new solution, developed by the Shanghai Institute of Organic Chemistry, the Third Military Medical College and Zhongshan Hospital in Shanghai, can be applied to any patient, regardless of blood group. It can be used in the treatment of cerebrovascular and cardiovascular diseases and other illnesses. China is second only to Japan in the number of cases treated with blood substitute, the paper said. Research institutes from Britain, France and the United States have expressed interest in co-operating with China in blood substitute research. [Text] [Beijing XINHUA in English 0141 GMT 19 May 86 OW] /6091

CSO: 4010/1040

ENVIRONMENTAL QUALITY

MAJOR DRIVE AGAINST ATMOSPHERIC POLLUTION PLANNED

HK270432 Beijing CHINA DAILY in English 27 May 86 p 1

[By staff reporter Wu Jingshu]

[Text] A major effort will be made in the next five years to solve the urgent problem of atmospheric pollution, according to the State Council Environmental Protection Commission.

By 1990, China hopes to reduce the dust in the air of urban areas by 30 percent--from the current 870 micrograms per cubic metre in north China to 500 and from 330 micrograms in south China to 250. The difference between north and south corresponds to the difference in coal consumption.

Traditionally, no heating is provided for residential buildings south of the Qinling Mountains in the west and the Huai River in the east.

Coal, which supplies more than 70 percent of China's energy, has been the principal cause of the country's worsening atmospheric pollution, according to statistics released by the commission yesterday.

Last year, China consumed 610 million tons of coal, which were responsible for release of 22 millions tons of coal dust and 13.1 million tons of sulphur dioxide. Since nearly half of these pollutants were discharged over urban areas, which occupy only 0.5 percent of China, atmospheric problems are particularly serious in cities.

In Beijing, where more than 18 million tons of coal are consumed annually, the average content of dust is 500 micrograms and sulphur dioxide 150 micrograms--well above the state standards, especially during the heating season.

In Shanghai, China's largest industrial city, where 19 million tons of coal plus 4.65 million tons of fuel oil are burned each year, most districts register similar pollution in excess of state limits. Shanghai had a dust fallout of 25 tons per square kilometre per month in its urban area in 1984.

A recent survey revealed that several southern cities are bothered by acid rain. The most serious case is in Chongqing, Sichuan Province, where heavy industrial fumes combine with fog, raising the acidity of the moisture to a pH value of 4.12 with a frequency of 90 percent.

Most harmful of the pollutants from burning coal is sulphur dioxide, of which more than 13 million tons are discharged over China each year, third highest in the world. The low efficiency of China's coal-burning equipment is partly to blame for its high pollution, as well as adding to its energy costs, according to the Environmental Protection Commission.

Overall, China consumes four times as much fuel per unit of national product as Japan, while its industries have an energy efficiency only half that of Japan. Therefore, the country plans to make every effort to cut fuel costs and to improve its industrial efficiency "through technical renovation", the commission spokesman said.

The state also plans to improve its environmental monitoring network and control system.

/6091
CSO: 4010/1044

ENVIRONMENTAL QUALITY

PROGRESS MADE IN BATTLE AGAINST AIR POLLUTION

OW261350 Beijing XINHUA in English 1332 GMT 26 May 86

[Text] Beijing, May 26 (XINHUA)--China's battle against air pollution has been largely successful but bad air is still costing the country 7 billion yuan a year, according to governmental environmental officials.

One sign of the success of the decade's anti-pollution efforts is that air quality is improving even as industrial output continues to expand, Qu Geping, director of the State Environmental Protection Bureau, told XINHUA.

"The past five years were the best ever for environmental protection," he said, citing the record number of laws passed and operations changed.

The main enemy of clean air in China is the country's dependence on coal for 70 percent of its energy--and coal produces soot when it is burned to generate heat or electricity.

Last year, for example, while the government worked to make the air cleaner, coal burning added 28 million tons of soot to the environment.

In such northern industrial cities as Beijing and Tianjin, suspended solids in the air still exceed government standards.

Over the past five years, the central government has passed air pollution laws and regulations including air quality standards and automobile emissions rules.

Central and local governments spent 23.3 million yuan establishing air monitoring systems in 30 of China's major cities, Qu said. At the same time, local governments have organized 148 soot-control zones in 90 cities trying to tackle the problem of bad air.

State-owned enterprises have done their part as well. For example, the Capital Iron and Steel Complex has spent 79 million yuan since 1983 on pollution control projects. As a result, the powder dust suspended above the complex was cut 134 milligrams per cubic meter to 51 miligrams.

New measures under consideration include centralizing city heating systems to make them more efficient, continuing the campaign to switch city residents from coal to gas stoves, and enlarging urban green areas.

/6091
CSO: 4010/1044

ENVIRONMENTAL QUALITY

BRIEFS

STEPS AGAINST POLLUTION AT OIL, GAS FIELDS--Beijing, February 14 (XINHUA)--Major steps to combat air and water pollution have been taken over the past five years at China's 15 oil and gas fields, "China Environment Journal" reported. The bi-weekly newspaper said 128 water-treatment plants, with a capacity to clean 500 billion liters of polluted effluent from oil fields, were built during the Sixth Five-Year Plan which has just ended. Ninety-four percent of polluted water from oil fields is now treated compared with 70 percent in 1981. Most ponds around China's largest oil field, Daqing, in northeast China, are now clean, and fish are bred in them. Meanwhile, three plants to treat sulphur fumes resulting from natural gas production methods were built in Sichuan Province, China's leading gas producer. In 1984, 67 percent of the 220 million cubic meters of fumes were desulphurized, and 77,000 tons of sulphur collected for use by the chemical industry. In addition, 15 environment-monitoring centers were set up in the oil and gas fields. [Text] [Beijing XINHUA in English 1209 GMT 14 Feb 86 OW] /6091

CSO: 4010/1044

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

BRIEFS

GANSU SCIENTISTS LEAD IN GLACIOLOGY RESEARCH--Lanzhou, March 14 (XINHUA)--Chinese scientists will continue their study on frozen earth and glaciers in western China, and try to solve the problems of road construction and housing in the permafrost areas of northeast China by 1990. Scientists from the Lanzhou Institute of Glaciology and Cryopedology in Gansu Province, the leading institute in this field, have made 180 scientific findings since 1958, when the institute was founded. Many of the findings have won state and Chinese Academy of Sciences prizes, an official of the institute said here today. The research institute has exchanged data with 164 organizations and individuals in 21 countries and concluded 11 agreements and memoranda on cooperative research and exchange with Australia, Britain, Canada, Federal Germany, Japan, Poland, Switzerland and the United States. [Text] [Beijing XINHUA in English 0705 GMT 14 Mar 86 OW] /6091

ANTARCTIC STUDIES SOCIETY--Beijing, May 17 (XINHUA)--An academic society of Antarctic studies was established here today. A consultative and examining organ responsible to the National Antarctic Research Committee, the society consists of research groups specialising in geology, geophysics, meteorology and space science, biology, geographic and environmental science as well as marine science. Sun Honglie, vice-president of the Chinese Academy of Sciences, was elected chairman of the society. In his speech at today's ceremony marking the establishment of the new society, Wu Heng, director of the National Antarctic Research Committee, said that the founding of the society will promote China's scientific research into the continent. He urged experts and scholars in various fields to make further contributions to this research. Meanwhile, it was revealed that a research institute for the polar regions is being built in Shanghai. The institute is expected to open in 3 years. [Text] [Beijing XINHUA in English 1214 GMT 17 May 86 OW] /6091

CSO: 4010/1041

Thermophysics

APPLICATION OF THERMODYNAMIC PARTIAL DERIVATIVES IN CALCULATING ROCKET PERFORMANCE PARAMETERS

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 6 No 1, Feb 85 pp 7-10

[English abstract of article by Zhang Baojiong [1728 1405 3518]]

[Text] In this paper, the partial derivatives of thermodynamic properties and performance parameters of rocket engines at various conditions are derived using exact thermodynamic partial derivatives. These partial derivatives are useful for the extrapolation and interpolation of thermodynamic calculations of changes in combustion pressure, initial enthalpy of propellant and pressure ratio or area ratio. The specific applications in calculating rocket performance parameters are discussed.

FLOW-FIELD MATRIX SOLUTION FOR FLOW ALONG ARBITRARILY TWISTED S_1 SURFACE EMPLOYING NON-ORTHOGONAL CURVILINEAR COORDINATES

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 6 No 1, Feb 85 pp 21-26

[English abstract of article by Wu Wenquan [0702 2429 2938] and Yu Haoyu [0060 3185 1342] of the Institute of Engineering Thermophysics, Chinese Academy of Sciences]

[Text] This paper consists of two parts: (1) Based on a set of given discrete points on several stream lines, a method for fitting an arbitrarily twisted S_1 stream surface has been developed. The fitted surfaces obtained by this method is compared with that obtained by the analytic method. The accuracy is about 0.004 percent, which is satisfactory for engineering applications. (2) Employing non-orthogonal curvilinear coordinates and the corresponding non-orthogonal velocity components, the stream function equation governing flow along the arbitrarily twisted S_1 stream surface has been solved using the matrix method. Some numerical examples are presented.

This method can also be used for an S_2 stream surface and other applications.

QUASI-THREE-DIMENSIONAL BLADE DESIGN CODE

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 6 No 1, Feb 85 pp 27-32

[English abstract of article by Wang Qinghuan [3076 1987 2719], Zhu Genxing [2612 2704 5281], et al., of the Institute of Engineering Thermophysics, Chinese Academy of Sciences]

[Text] Based on Wu's general theory of 3-D flow in turbomachines, an automatic code system for the blade design of a subsonic axial-flow turbomachine has been developed. Using the code system, a user must specify the input data and investigate the calculation results.

The code system, which includes several individual codes, is executed automatically without any personal interference. The code system can substantially reduce the time and personnel needed for design work, and provides the possibility of choosing among a large number of design schemes. It has become an effective instrument for turbomachine design work.

SOLUTION OF TRANSONIC FLOW THROUGH THREE-DIMENSIONAL TURBINE BLADE

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 6 No 1, Feb 85 pp 33-36

[English abstract of article by Jiang Shiyan [5592 1709 8827], et al., of Qinghua University]

[Text] A numerical technique with artificial viscosity is presented for the calculation of transonic flow through a three-dimensional turbine blade. The problem is posed in time-dependent form. In order to make the analysis manageable, the stream surfaces are assumed to be axisymmetric. Two examples are given. The solutions exhibit the position of shocks and static pressure distribution on the blade surface.

FAMILIES OF VARIATIONAL PRINCIPLES FOR SEMI-INVERSE AND TYPE-A HYBRID PROBLEMS ON A S_2-STREAMSHEET IN MIXED-FLOW TURBOMACHINES

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 1, Feb 85 pp 37-39

[English abstract of article by Cai Rongquan [5591 2837 3123] and Liu Gaolian [0491 7559 5114] of Shanghai Institute of Mechanical Engineering]

[Text] In this paper, as a unification and extension of the authors' previous work, two families of variational principles (VP_s) for the semi-inverse and type-A hybrid problems of S_2-streamsheets in mixed-flow turbomachines are developed. The momentum equation in an arbitrary quasi-orthogonal direction-y is chosen as the primary equation, and a corresponding image plane is introduced. Taking advantage of natural boundary conditions and artificial interfaces, these VP_s provide a reliable theoretical basis for FEM or other direct variational methods.

GENERAL THEORY OF HYBRID PROBLEMS OF FULLY 3-D COMPRESSIBLE POTENTIAL FLOW IN TURBO-ROTORS. I. AXIAL FLOW, STREAM FUNCTION FORMULATION

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 6 No 1, Feb 85 pp 40-45

[English abstract of article by Liu Gaolian [0491 7559 5114] of Shanghai Institute of Mechanical Engineering]

[Text] Here it is shown that for fully 3-D flow a great variety of hybrid (i.e., direct-inverse) problem types are possible, and their unifited theory, based on an image-space concept, is developed. The present theory, in principle, is general in the sense that it can be extended to radial- and mixed-flow rotors, and to rotational and separated as well as viscous flows. This theory provides a series of novel ways for aerodynamic design and analysis of rotor-bladings, which can account for aerodynamic, material strength, cooling and technological requirements. It can also be used as a part of the optimal design theory presented in a previous paper.

COMPUTATION OF THRUST PERFORMANCE OF AXISYMMETRIC NOZZLES

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 6 No 1, Feb 85 pp 46-48

[English abstract of article by Jiang Zikang [5592 3320 1660] of Qinghua University]

[Text] A time marching method is used to compute the transonic nonviscous flow field and a finite difference method to compute the boundary layer of axisymmetric nozzles. The influence of the boundary layer on nonviscous flow is considered with the calculated displacement thickness, and an iteration procedure is used. The thrust of the nozzle is then computed from the flow field parameters. The computed results are compared with the experimental data, and the average relative error, about 2 percent, satisfies the engineering needs.

EXPLICIT EXPRESSION TO PREDICT EROSIVE BURNING RATE OF SOLID PROPELLANTS

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 6 No 1, Feb 85 pp 84-86

[English abstract of article by Wang Shoufan [3769 1343 5400] of Beijing Institute of Technology]

[Text] According to the theory of gas dynamics and heat transfer from turbulent gas flow to the burning surface of a propellant along a permeable wall, this paper has derived an explicit expression to predict the burning rate of the solid propellant with crossflow. Calculation results are compared with experimental data and are proven to be correct.

9717
CSO: 4009/75

END